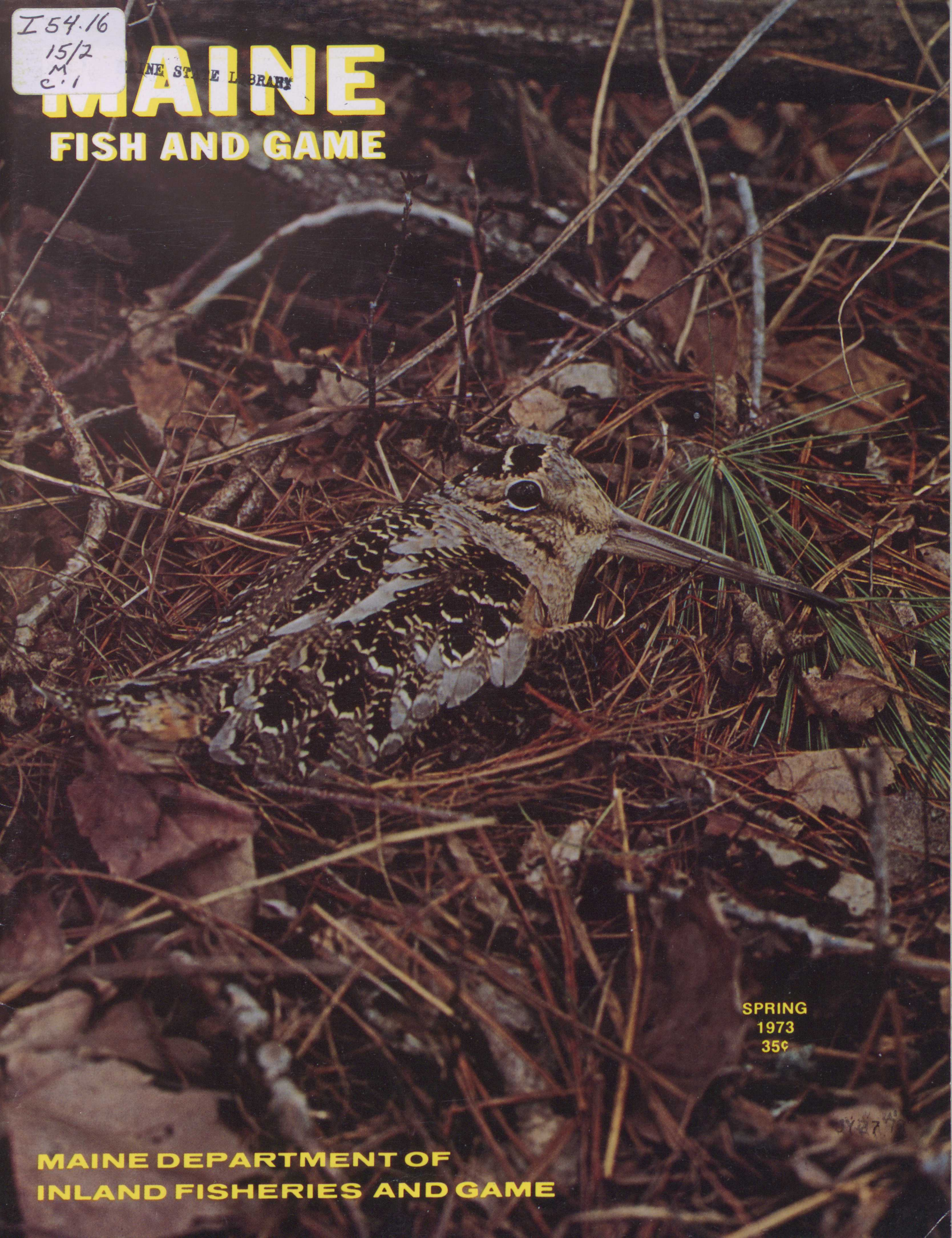
MAINE
FISH AND GAME



SPRING
1973
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MAINE DEPARTMENT OF
INLAND FISHERIES AND GAME


MY DAD
IS A
Legion

Governor
Kenneth M. Curtis

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MAINE FISH AND GAME

STATE OF MAINE

Spring, 1973 **Vol. XV, No. 2**

THE COVERS

Front and Back: Our second full color cover features a nesting woodcock and its four eggs, both photographed in Mt. Vernon by Bill Cross. The winter scene on the cover of the last issue prompted many favorable comments and some questions; see page 30 for information on that cover and our future plans for color pictures.

Inside Front: Summer fun, just around the corner. Make sure your boy doesn't miss it — take him fishing. Photo by Bill Cross.

Inside Back: Everybody knows that litter is not very pretty to look at, but did you know that it can actually be dangerous to wildlife? That is the message of a poster distributed by the Keep Maine Scenic Committee.

GIVE WILDLIFE A BREAK...

Every year at about this time, conservation agencies across the nation find it necessary to start issuing pleas to the public to leave young wildlife where they find it. And we in Maine are no exception. We all know that each spring, many Maine citizens find young birds and animals — especially furry little animals with appealing eyes — which appear to be deserted or orphaned. No adult is in sight so the assumption is made that the little ones are alone in the world and will surely die if they are not rescued.

In almost every instance, though, the mother is hovering nearby, afraid to show up but still much concerned for her young. Taking the young ones home is not only unlawful but is usually a sentence of death to the "orphan." The difficulties of providing the proper diet, for example, are generally insurmountable. Read the story of Warden John Leathers and the beaver kits he tried to save, in this issue of **Maine Fish and Game.** In spite of his 'round the clock care and the expert advice he got, things didn't work out for the little beaver. And the one that survived became something of a problem, leaving behind, when he finally disappeared, a question of how well he would make out in a world for which he was not well prepared.

If you find young wildlife and there is definite evidence that the mother is dead, call a warden. If that evidence is not at hand — if the youngsters are just there, alone — leave them that way. You can bet that their mother will show up in a little while and anxiously take charge of her family again.

...AND A BRAKE

The companion editorial to this concentrates on *young* wildlife; this one concerns wildlife of *all* ages, whose battered remains appear on our highways at all times of the year, with young ones showing up mainly in late spring and early summer.

Automobiles and wildlife are not equal competitors — in a collision, the wildlife loses. But the car often does not come off scot free. Indeed, if a car strikes an animal as large as a deer or a moose, serious damage frequently results, and sometimes drivers and passengers are injured or even killed.

Driving with care — giving wildlife a "brake" — is giving wildlife a *break*, too, and is good insurance for the motorist, who stands to suffer lost time, lost money, and inconvenience if a collision occurs, not to mention the painful concomitants of injury or death.

So watch out for wildlife. Be alert for animals or birds that may suddenly take a collision course toward your car. At night, don't drive beyond your headlights; and in the daytime, be sure you can stop or slow down in a hurry if need be.

We all hurry most of the time. But do we really need to? ■

"Club" Fish—1972

IF ENTRIES in Maine's official fishing contest mean anything, bass fishing in 1972 was something extra special. Out of a total of 123 whopping big fish of all species entered in The One That Didn't Get Away Club last year, 78 were bass.

To make the Club, a bass must weigh at least five pounds. Largemouth bass and smallmouth bass are lumped together and called "black bass" to eliminate identification problems. This may put the smallmouth at a disadvantage in the competition because, as the man says, "a five pound smallmouth is a lot bigger than a five pound largemouth." But, just the same, 78 bass better than five pounds is a whole bunch of big bass any way you figure it.

The tally of the other big fish registered in the Club is as follows: brook trout, 4; brown trout, 11; lake trout, 7; landlocked salmon, 7; Atlantic salmon, 3; and pickerel, 13. There were no rainbow trout or white perch entered in 1972.

The One That Didn't Get Away Club, which is run by the Department of Commerce and Industry, has categories only for the more common game fish species. Although the Club does not recognize blueback trout and cusk, the state record list which is maintained by the Fish and Game Department does. We are happy to say that new state records were established for both of these species in 1972. On May 10, Gary Pettengill of Livermore Falls set a state record with a blueback trout he caught at Basin Pond in Fayette; this fish weighed 3 pounds, 4 ounces, and was 20-1/2 inches long. The new mark for cusk — 14 pounds, 1 ounce — was established on August 15 at St. Froid Lake by Gordon Saucier of Winterville.

The top few Club fish of each species are listed below. ■

THE ONE THAT DIDN'T GET AWAY CLUB FOR 1972		Pounds Ounces	Length Inches	Date Caught	TOP FISH IN EACH CATEGORY	
The Fish	The Angler				Where Caught	Lure
Brook Trout (Minimum weight 5 lbs.)	Frank R. Bickford, Mercer, Me.	6-12	26	6/3	Great Pond (Belgrade)	sewed bait
	George Michaud, Jr., Howland, Me.	5-8	21	9/23	2nd Chase Lake	worms and spinners
	Walter Daoust, Farmington, Me.	5-3	20	8/26	Pleasant Pond (Caratunk)	sewed smelt
	Ralph E. Marceau, Livermore, Me.	5-1	22½	5/23	Chamberlain Lake	Mepps Black Fury 2
Brown Trout (Minimum weight 8 lbs.)	Ray Lavalley, Merrimac, Mass.	13-2	30	9/3	Great East Lake	Sutton #35
	Kenneth Hannon, N. Vassalboro, Me.	12-9	32	5/13	China Lake	red & white streamer
	Leo Gagne, Lewiston, Me.	9-0	27	9/28	Worthly Pond	live bait
	Charles Winslow, Sr., Augusta, Me.	8-10	28	5/8	China Lake	sewed smelt
	William O. Chandler, Biddeford, Me.	8-8	28	3/3	Ossipee Lake	shiner
Lake Trout (Togue) (Minimum weight 15 lbs.)	Ethemer Stevens, Norridgewock, Me.	22-12	38½	8/15	Embden Pond	Mooselook Wobbler
	Wilfred R. Chouinard, Rumford, Me.	22-0	37	8/13	Sebec Lake	Chev-Chase
	Joey Rodrigue, Winslow, Me.	18-4	38	6/3	Moosehead Lake	cut bait
	Raymond Marr, Oakland, Me.	17-0	35	6/15	Moosehead Lake	live bait
	Millard E. Emanuelson, Portland, Me.	16-0	35-3/4	8/17	Hebron Lake (Monson)	Mooselook Wobbler
	Tere K. Porter, Norway, Me.	16-0	32¼	7/2	First Roach Pond	sewed bait
Landlocked Salmon (Minimum weight 8 lbs.)	William F. Goodspeed, Bucksport, Me.	9-13	28	7/4	Lake St. George	live bait
	Walter L. Mattson, Stockholm, Me.	9-8	28¼	9/25	Mud-Cross lake thoroughfare	#8 parma belle
	Ray Siver, Loring AFB, Me.	8-10	28½	9/30	Cross Lake	roosters regret streamer
	Cye Hill, Auburn, Me.	8-8	27	7/31	Sebago Lake	sewed bait & Davis spoons
	Benjamin F. Safford, Raymond, Me.	8-5	28½	5/19	Panther Pond	grey ghost streamer
Atlantic Salmon (Minimum weight 15 lbs.)	Thomas Bacigalupo, Wakefield, Mass.	21-4	38½	5/29	Narraguagus River	Cosseboom
	Frank J. Thomas, Leominster, Mass.	16-2	35	6/11	Narraguagus River	Mickey Finn
	Denny McNeish, Machias, Me.	15-2	35	7/4	Machias River	black bear hair
Black Bass (Minimum weight 5 lbs.)	Galen F. Chambers, Gorham, Me.	8-14	24	8/28	Moose Pond (Bridgton)	Hula popper
	Patrick Lunt, Hallowell, Me.	7-7	23	9/24	Cobbossee Lake	night walker
	George Roberts, Whitman, Mass.	7-6	22-3/4	7/2	Little Sebago Lake	Jitterbug
	Thomas D. Dixon, Dayton, Ohio	7-4	23	8/24	Pleasant Pond (Richmond)	Jitterbug
	Linda J. Hart, Natick, Mass.	7-4	24	9/21	Cochnewagon Lake	rubber worm
	Chris Whittaker, Bath, Me.	7-4	24½	3/12	Center Pond (Phippsburg)	live bait
Pickerel (Minimum weight 4 lbs.)	Earl McKenney, Camden, Me.	5-8	24½	2/27	Megunticook Lake	red dace
	Ellis A. Chevenir, Norridgewock, Me.	5-2	26½	3/19	Salmon Lake (Belgrade)	shiner
	Robert Lanese, New York, N.Y.	5-2	29½	9/6	Salmon Lake (Belgrade)	spinner-minnow
	Gary Baldwin, Emery Mills, Me.	5-0	26-5/8	2/6	Mousam Lake	bait
	Armand Poulin, Kittery, Me.	4-7	26-3/4	5/21	Long Pond (Belgrade)	live smelt

Hunter recoveries of banded woodcock are helping biologists learn more about this increasingly important game bird.

PROBING THE SECRETS

Banded Maine Woodcock

By William B. Krohn
Research Biologist
U.S. Bureau of Sport Fisheries and Wildlife

WOODCOCK migrations cannot be easily observed since woodcock, unlike ducks and many other birds which are daytime migrants, travel only at night. The inconspicuous movements of woodcock between breeding and wintering areas have long fascinated both scientists and sportsmen. Both groups of people are now co-operating to uncover many of the mysteries surrounding the sojourns of this secretive game bird.

Where do woodcock from various northern states spend the winter? When, and how fast, do birds migrate? These questions, and many others, are being answered by the growing number of banded woodcock which have been found and reported by hunters and other interested persons.

Twenty years ago, biologists did not know how to capture large numbers of woodcock between the end of the nesting season and the start of the fall migration. Birds never seemed to be concentrated, and, thus, it was difficult trapping widely scattered individuals. However, in the mid-1950's, Dr. William G. Sheldon, then Leader of the Massachusetts Cooperative Wildlife Research Unit, discovered and reported woodcock flying into fields during summer evenings. In some fields, 20 to 30 birds could be counted flying over a few acres. Post-sunset and pre-sunrise flights to and from fields have been subsequently observed throughout the woodcock's range.

While capture techniques are still being developed, biologists now have two methods to catch woodcock on summer fields. In one method, ten foot high nets are placed in a field known to be used by roosting birds. Nets are erected before sunset. When woodcock fly into the field at dusk, they become entangled in the fine mesh. The second method is to have a crew, carrying long handled nets and lights powered by 12 volt batteries, search fields at night. Some birds are spotted and netted on the ground before flushing. However, most woodcock are flushed and then illuminated by the spotlights. Once spotted in the air, an average of four out of ten birds become confused by the bright lights, and they realight on the field. The disoriented woodcock are quickly but quietly approached and netted. After being captured and banded, the age and sex of each bird is determined before the woodcock is released unharmed.

THE SUMMER banding of woodcock in Maine started in 1962 at the Moosehorn National Wildlife Refuge near Calais. The Maine Department of Inland Fisheries and Game initiated woodcock banding the following year in the lower Penobscot River Valley. The Maine

Woodcock Investigation, sponsored by the U. S. Bureau of Sport Fisheries and Wildlife (see **Maine Fish and Game**, Spring 1969), further enlarged banding operations by working new areas in the Penobscot Valley and, in the summer of 1970, the lower Kennebec River Valley. Wildlife ecologists at the University of Maine have also banded woodcock in central Maine as part of various studies. The combined efforts of these organizations have accounted for almost 6,000 birds marked with individually numbered leg bands between 1962 and 1971. During the past 10 summers of work, the number of birds banded per year steadily increased from 255 in 1962 to 1,240 in 1971.

Banding is continuing, but enough information is available for some preliminary conclusions. This article discusses a few of the facts learned from studying recoveries of woodcock banded in Maine during the summer. Biologists are confident that most of the woodcock caught in this state between May and September are Maine "residents" and not migrants passing to or from more northerly nesting grounds.

More than 5 per cent of the 5,960 bandings, or 324 birds, have been reported to the U. S. Bureau of Sport Fisheries and Wildlife as shot or found dead during the hunting seasons of 1962-63 through 1971-72. Migration routes and wintering areas can be determined by plotting and studying the locations of these recoveries on a map of the eastern United States (Figure 1). When looking at this map, keep in mind that many factors influence the distribution of band recoveries. First, woodcock are not hunted with the same intensity in all states. Perhaps the lack of a woodcock hunting tradition in much of the South is the reason why so few bands were reported from Alabama, Florida, and Georgia. The chance of a person finding a band increases as banded birds migrate through states with dense human populations. The relatively large number of recoveries from eastern Pennsylvania, southern New York, New Jersey, and Connecticut was probably influenced by large populations of people. And finally, the lack of recoveries in some areas may simply mean that few woodcock visit these places.

Figure 1, even in light of the preceding limitations, clearly shows that the majority of Maine's birds migrate southwesterly in the fall between the Appalachian Mountains and Atlantic Ocean. Few Maine woodcock were reported west of the Appalachians. Because woodcock probably migrate only a few hundred feet above the ground, the Appalachian Mountains may be a barrier. The Appalachians, however, do not stop all migrants because some Maine birds were recovered west of the mountains. In New England, the Appalachians run largely in a north-south direction. In Pennsylvania, the ridges change to a north-easterly through southwesterly axis. The occurence of Maine banded woodcock in central and western Pennsylvania suggests that some birds migrate west through river gaps in these ridges into the Central States. The few Maine woodcock reported from the Gulf States could have moved south from western Pennsylvania or passed around the southern end of the Appalachians in northern Alabama (Figure 1).

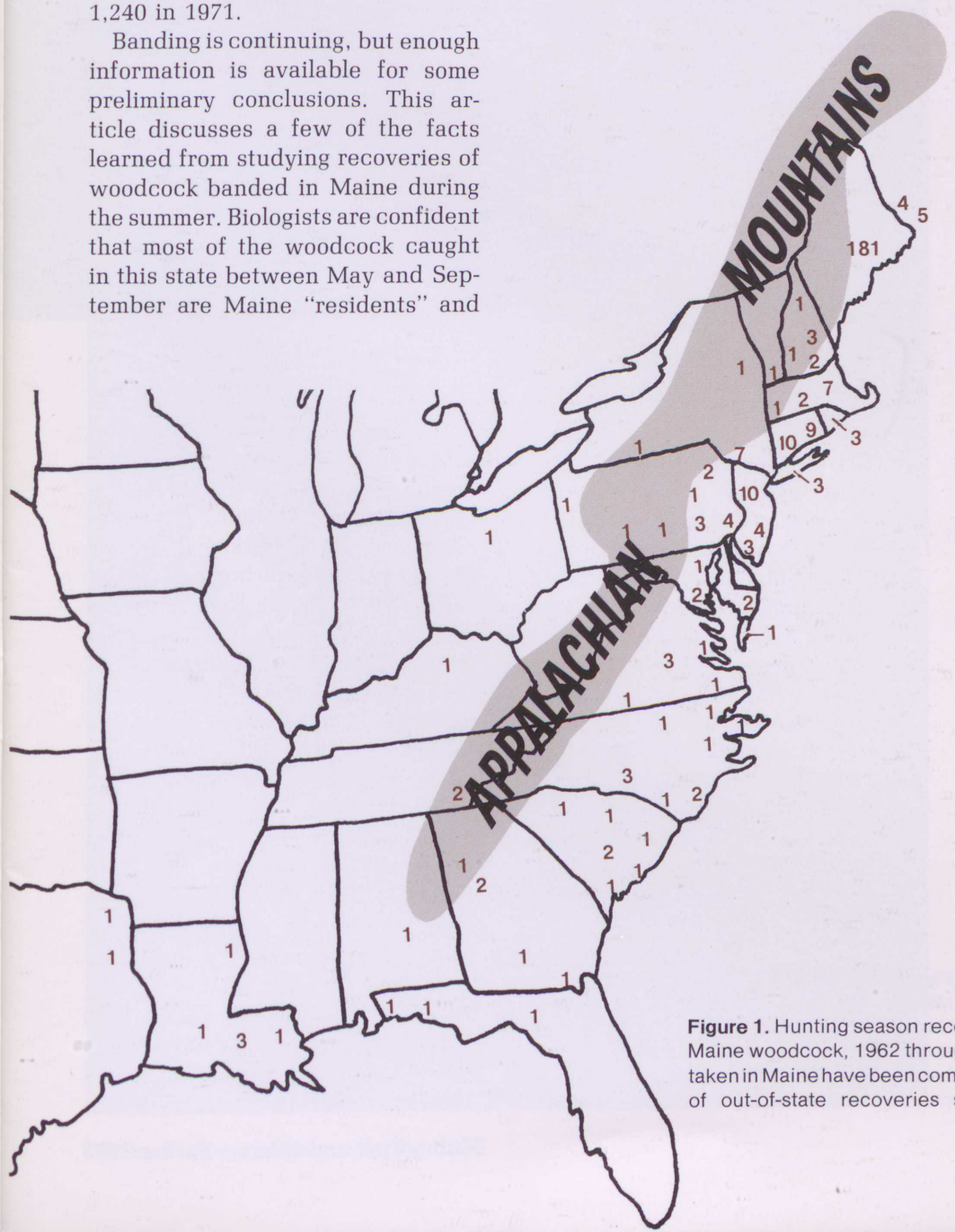

Figure 1. Hunting season recoveries of summer banded Maine woodcock, 1962 through 1971. Bands reported taken in Maine have been combined, with the locations of out-of-state recoveries shown by degree blocks.

MOST RECOVERIES reported from Maine were from birds taken by hunters near banding fields. The

more distant in-state recoveries showed that birds started migrating southwesterly even before leaving Maine. Some hunters, after sending in one or two bands, may not report additional bands they find. These hunters usually assume that all of the birds were banded in the same place and at the same time. This is unfortunate because every recovery provides valuable information. Bands recovered by hunters enable biologists to ascertain how long woodcock live and provide data on the bird's ability to return to the areas in which they were raised. Most woodcock seem to return summer after summer to their natal areas. However, some birds migrate to nesting grounds other than where raised. For example, nine immatures (seven females, two males) banded on summer fields in central and eastern Maine were shot, two hunting seasons after banding, in New Brunswick, Canada (Figure 1). Woodcock which migrate to new breeding grounds could start populations in previously unoccupied covers or re-establish breeding populations in coverts which have been over-harvested.

Louisiana has long been known for its concentrations of wintering woodcock. In years past, many persons believed that most of the continent's woodcock population wintered in that one state. This is no longer believed to be true. Although some Maine birds do winter in Louisiana, and as far west as eastern Texas, band recoveries now show that most Maine woodcock spend the winter in the Southeastern States from North Carolina to Georgia.

You are probably asking, "If Louisiana has so many wintering birds, where do they come from?" This, too, has recently been revealed by banding. More than 17,000 wintering woodcock were banded by state and university wildlife workers in Louisiana between 1948 and 1968. Recoveries have shown that more than three-fourths of the birds caught in Louisiana were produced west of the Appalachian Mountains. Woodcock from New England and the Maritime Provinces tend to winter in the Southeast, whereas birds from the Great Lakes States and Ontario winter in the Gulf States, primarily Louisiana. Although more data are needed before biologists can be sure, the discovery of Atlantic and Central woodcock flyways could be of great importance to wildlife managers. Federal and state hunting regulations could then take into account differences between these two woodcock populations.

THE SUBJECT of when woodcock migrate is a constant source of speculation by hunters and biologists alike. Although no final answer is available, and variations in movements as related to age, sex, and weather patterns are little understood, the general timing of the autumn migration is known. Birds banded in Maine during the summer were shot in Maine from late September through early November (Figure 2). However, the number of recoveries in Maine dropped in mid-October, indicating that some birds had departed. In late October, increasing numbers of Maine banded birds were shot and reported from southern New England. Not until early November did the number of Maine woodcock peak in New Hampshire, Vermont, New York, Massachusetts, and Connecticut.

Maine woodcock rapidly pass from southern New England through the Mid-Atlantic States and spend December through February in the

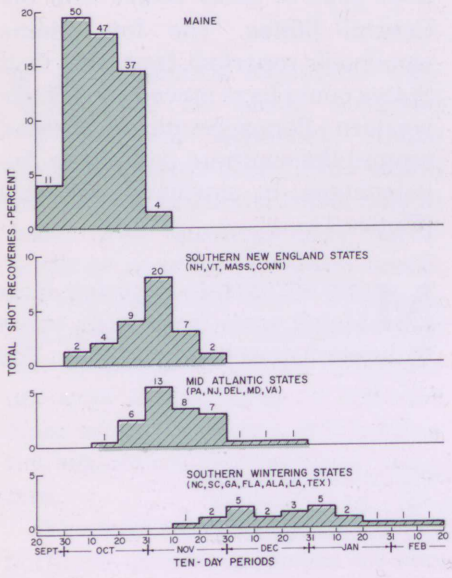

Figure 2. Timing of the fall migration of Maine woodcock as indicated by band recoveries, 1962 through 1971. Numbers above bar graphs represent summer banded Maine birds shot during a particular 10-day period in the states indicated.

bottomlands of the Southeast. Since hunting is illegal in the spring, little is known about the timing of migration then. However, a few bands from birds found dead in the spring show that Maine birds return by routes east of the Appalachians. Woodcock first arrive in Maine from the wintering grounds in late March, but spring flights usually do not peak until early April.

The straight line distance between central Maine and central Georgia is approximately 1,200 miles. Assuming that it takes a woodcock from the middle of October to mid-December to migrate from Maine to Georgia, a bird would have to fly only an average of 20 miles per night. While this rate of migration is speculation, the scattered distribution of recoveries along the Atlantic shoreboard suggests that woodcock migrate only short distances each night. Woodcock probably interrupt their migration for a few days at a time to feed and rebuild their energy reserves. Logically, the distances flown each night would be expected to vary depending upon the bird's physical condition, food supply, weather conditions, and other factors.

The percentage of Maine birds shot decreased the farther south the birds migrated (Figure 2). Of the 324 recoveries on hand, 56 per cent (181 birds), were reported from Maine (Figure 1). Maine woodcock are presently harvested primarily in our state. The proportion of Maine birds taken on wintering areas, however, may increase slightly in the future since the sport of timberdoodle hunting is growing in the South.

Recoveries of banded woodcock are telling biologists more than the few aspects of migration discussed here. For example, banding and recovery data reveal that young birds are approximately 20 per cent more vulnerable to shooting than adults. The reason why proportionally more immature than older birds are shot is unknown, but this fact is, in itself, useful to wildlife managers. Biologists are also starting to measure the woodcock's longevity. Males are not as long-lived as females, possibly because of the stress encountered by males in the spring during migration and competition for courtship sites. Although a few males have been shot or recaught three and four years after banding, one female retrapped at the Moosehorn Refuge was eight years old!

Woodcock can be captured for banding purposes on roosting fields by mist-netting shortly after sunset (left), and by night-lighting throughout the night (below).

THE CO-OPERATION of Maine people during our banding studies deserves special recognition. All landowners contacted have permitted banding crews to work on their properties. Maine sportsmen and other concerned persons have freely troubled themselves to report banded woodcock they have obtained. Only with your continued support can biologists continue probing the secretive life of the American woodcock. ■

STATE LAUNCH SITES

By Thomas Chamberlain
Information Officer
Department of Parks and Recreation

WITH THE ARRIVAL of spring and ice-out, boating enthusiasts have launched the 1973 season on Maine's lakes and streams and on the ocean. Fresh-water fishermen, salt-water sailors, and just plain boaters — all are welcome to use the 51 launching ramps of the Department of Parks and Recreation.

These boat access facilities on Maine's waterways are provided under a special program funded by a portion of Maine's gasoline tax. Some of them are operated and maintained by the Department, while others are kept in operation by the nearby communities.

Ocean sites can be found at Bar Harbor, Damariscotta, Dennysville (Cobscook Bay State Park), Lamoine (Lamoine State Park), Lubec, Port Clyde, Searsport, Swans Island, Tenants Harbor, and Westport Island. Parking is limited at Port Clyde and at Westport Island, however.

Sites are also located on the New Meadows River at Brunswick, on the Saco River at Biddeford, on the Piscataqua River at Eliot, on the Kennebec River at Hallowell, Richmond and Skowhegan, and on the Penobscot River at South Orrington and Verona.

Giving access to lakes and ponds across the state are facilities on Great East Lake in Acton, Messalonskee Lake in Belgrade, Long Lake in Bridgton, Grand Lake in Danforth, Eagle Lake in Eagle Lake, Black Lake in Fort Kent, Trafton Lake in Limestone, Tacoma lakes in Litchfield, Pushaw Lake in Orono, Portage Lake in Portage, Maranacook and Torsey lakes in Readfield, Long Lake in St. Agatha, Spednic and LaCoute lakes in Vanceboro, Little Ossipee Lake in Waterboro, and Echo Lake in West Mt. Vernon.

Also, Horn Pond in Acton, Great Pond in Belgrade, Lovewell Pond, in Fryeburg, Egypt Pond in Chesterville, Mattanawcook Pond in Lincoln, Embden Pond in North New Portland, North Pond in Smithfield, Unity Pond in Unity, Three Mile Pond in Vassalboro, and Taylor Pond in West Mt. Vernon.

Sites mentioned at Egypt Pond and LaCoute Lake have no ramps, but vehicles can be driven right to the water's edge.

In addition to those state parks mentioned as having salt-water launching facilities, fresh-water facilities are found at Lily Bay State Park (Moosehead Lake) in Greenville, Lake St. George State Park (Lake St. George) in Liberty, Sebago Lake State Park (Sebago Lake) in Naples, Aroostook State Park (Echo Lake) in Presque Isle, and Rangeley Lakes State Park (Rangeley Lake) in Rangeley.

These boat access facilities are helping to ensure the outdoor enthusiasts' continued enjoyment of Maine's unsurpassed boating and fishing waters. ■

Maine's

By Kendall Warner
[illegible]hery Research Biologist

Whatever you think of when you hear "smelts," I am sure you will agree that this little fish is an im-

sizzling pan-full of these tempting morsels cooking over an open fire—enough to start your salivary glands working in high gear.

The ardent bait fisherman thinks of Mr. Smelt sewed on a snelled hook and whirling through the water in corkscrew motion in a manner almost impossible for any game fish to resist. The rugged individual known as a smelt dipper envisions a seething mass of hundreds of slim, writhing forms anxiously running up their favorite smelt brook on the annual spring spawning run.

state as a result of both "official" and unauthorized introductions.

Fresh-water smelts are generally considered to be cold-water fishes, thriving in deep, cold, stratified (oligotrophic) lakes, and occupying the same habitat as cold-water game species such as salmon, trout, and togue. Preference for cold-water environments may, indeed, be the general rule, but there is abundant evidence from Maine studies showing that smelts are not at all confined to this type of habitat. In fact, populations of smelts were found to be present in 51 (16

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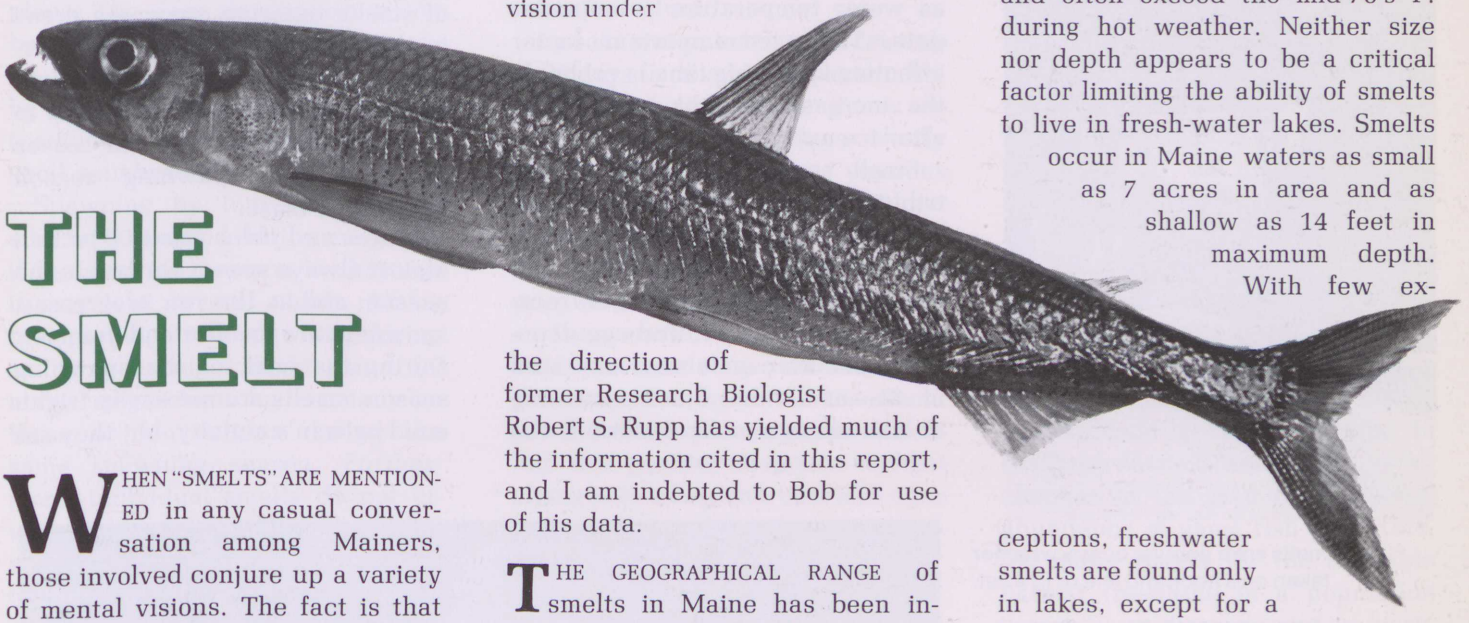
oxygen although occasional schools of smelts make forays into shallow water.

Smelts range throughout the entire water volume of a lake in the fall after break-up of summer stratification. During the fall, smelts wander widely and are frequently found in very shallow water near shore. In several instances during the fall, smelts have wandered into lake outlets in such large numbers that local residents believed a fall spawning run was in progress. This wide-ranging behavior continues into the winter, when ice fishermen

Maine's Most Versatile Fish

THE SMELT

By Kendall Warner
Senior Fishery Research Biologist



WHEN "SMELTS" ARE MENTIONED in any casual conversation among Mainers, those involved conjure up a variety of mental visions. The fact is that almost every "native" who frequents the out-of-doors has run up against this glimmering, silver critter at one time or another, under a variety of circumstances. One thing is sure, under whatever conditions you have met Mr. *Osmerus mordax*, he has certainly left you with some kind of a definite impression. If you are the gourmet type, you immediately think of a sizzling pan-full of these tempting morsels cooking over an open fire—enough to start your salivary glands working in high gear.

The ardent bait fisherman thinks of Mr. Smelt sewed on a snelled hook and whirling through the water in corkscrew motion in a manner almost impossible for any game fish to resist. The rugged individual known as a smelt dipper envisions a seething mass of hundreds of slim, writhing forms anxiously running up their favorite smelt brook on the annual spring spawning run.

Whatever you think of when you hear "smelts," I am sure you will agree that this little fish is an important resident of Maine's fish community. In this article, I will attempt to tell you something about the smelt's life history and ecology and its role in management of our game fish waters. A 10-year research project by the Fishery Research and Management Division under the direction of former Research Biologist Robert S. Rupp has yielded much of the information cited in this report, and I am indebted to Bob for use of his data.

THE GEOGRAPHICAL RANGE of smelts in Maine has been increased markedly by the activities of man over the past 100 years. Although we have little information on the exact natural distribution of smelts in Maine's inland waters, indications are that this species originally occurred only in waters within 50 to 60 miles of the coast. Our continuing lake studies have shown that smelts are now distributed widely throughout the state as a result of both "official" and unauthorized introductions.

Fresh-water smelts are generally considered to be cold-water fishes, thriving in deep, cold, stratified (oligotrophic) lakes, and occupying the same habitat as cold-water game species such as salmon, trout, and togue. Preference for cold-water environments may, indeed, be the general rule, but there is abundant evidence from Maine studies showing that smelts are not at all confined to this type of habitat. In fact, populations of smelts were found to be present in 51 (16 per cent) of 327 typical warm-water lakes surveyed through 1957.

Some of these lakes do not stratify into warm and cold layers during the summer but remain about equal in temperature from top to bottom and often exceed the mid-70's F. during hot weather. Neither size nor depth appears to be a critical factor limiting the ability of smelts to live in fresh-water lakes. Smelts occur in Maine waters as small as 7 acres in area and as shallow as 14 feet in maximum depth. With few exceptions, freshwater smelts are found only in lakes, except for a brief period during the spring when they often ascend tributaries to spawn. Smelts have occasionally been found in lake outlets during the summer where they apparently drifted during high water in the spring and were unable to re-enter the lake. Normal habitat during the summer in stratified lakes is in the cooler, deeper water containing good dissolved oxygen although occasional schools of smelts make forays into shallow water.

Smelts range throughout the entire water volume of a lake in the fall after break-up of summer stratification. During the fall, smelts wander widely and are frequently found in very shallow water near shore. In several instances during the fall, smelts have wandered into lake outlets in such large numbers that local residents believed a fall spawning run was in progress. This wide-ranging behavior continues into the winter, when ice fishermen

swim close to the bottom, often seeking protection from the current behind logs, boulders, or other obstructions.

ACTUAL SPAWNING OCCURS in groups or compact schools, with both males and females swimming vigorously against the current near bottom. Eggs and milt are shed into the water, and fertilization takes place. The eggs slowly sink to the bottom where they become attached to the first object they touch, by means of a stalk-like protrusion (pedicel) formed from the outer shell membrane.

Spawning by individual smelts may be completed during one night if the spawning season is short, or it may take several nights. Males may participate in spawning during as many as eight nights, and females may return for as many as three or four nights during the same spawning season. Furthermore, individual smelts do not always complete their spawning activity in the same location. Continuous wandering may result in an individual spawning in several locations or brooks in the same spawning season.

Use of tributaries is not essential to successful smelt reproduction. Maine studies have shown that successful spawning along the shores is responsible for maintaining abundant smelt populations in a number of waters. Furthermore, survival of shore-spawned eggs is very nearly the same as of eggs spawned in tributaries.

Density of deposition of eggs in spawning areas affects the percentage of eggs that hatch successfully. Very large numbers of eggs may be laid in favorable locations when "heavy" runs of smelts occur. Repeated observations have shown very high mortality beneath the surface of these thick mats of eggs, which often become infected with fungus growth. Survival is much higher where eggs are scattered no more than one or two layers deep. The optimum density for best survival is probably somewhat less than 600 eggs per square inch.

Overall survival of smelt eggs to a stage immediately after hatching, in tributaries, ranges from 1 to 5 per cent at egg densities of from 1,500 to 13,000 per square foot. Survival of shore spawned eggs ranges from 0.1 to 2.1 per cent at egg densities of 500 to 11,000 per square foot.

In cold water, smelt eggs take up to 30 days to develop and hatch, but in warmer water, hatching may occur in as little as 10 days. Newly hatched smelt fry are vigorous swimmers and are attracted to light during their first several days of life. This response serves the purpose of getting the fry up into the surface current of the spawning stream where they will be swept downstream into the lake. About the third or fourth day after hatching, this positive response to light changes to a negative one; and once in the lake, smelt fry seek the deeper waters.

THE FIERCE APPEARANCE of larger smelts, displaying a mouthful of sharp, pointed teeth, has led to the false conclusion by many people that smelts may be a serious predator of the young of game fishes. On the contrary, exhaustive studies of smelt food habits both in Maine and other states have failed to show that smelts are an important predator on other small fish. The principal food of the smelt is small invertebrates (zooplankton) and insects; young game fish have rarely been found. Large smelts occasionally eat fish, but the fish eaten are almost always smaller smelts.

Smelt populations in Maine's inland lakes commonly experience wide fluctuations in abundance from year to year. This fact is very upsetting to our fishery scientists who are concerned with keeping abundant populations of smelts as food for game fishes. Population "crashes" of smelts often deplete available food to such a low level that game fish growth and survival are severely reduced, resulting in poor fishing.

Once this situation occurs, what can the fishery manager do about it? There are several management alternatives: We can wait until the smelts "come back on their own," we can stock more smelts to help bring back the population, or sometimes we can institute changes in fishing regulations (such as a lower length limit) that will permit fishermen to harvest more of the slower growing game fish and thereby reduce the amount of game fish predation on the depleted smelt supply. All three approaches have been tried successfully in Maine lakes, sometimes simultaneously.

Concerted attempts to find out why smelts fluctuate so widely in abundance have met with only limited success. Possible reasons may include yearly variations in hatching success and fry survival, changes in the lake environment, abundance of game fish predators, too many smelts for the available habitat (resulting in a population "crash"), or diseases and/or parasites. Future studies will, we hope, shed more light on why our freshwater smelts experience such ups and downs in abundance.

The maximum size attained by smelts is highly variable among lakes. In some lakes, they never get any larger than 3 or 4 inches, but smelts nearly 16 inches long have been found in other lakes. Average lengths in different lakes may range from less than 3 inches to more than 12 inches. The usual size of smelts in most Maine waters is 4 to 8 inches.

The average smelt in Maine lakes is slightly over 2 years old so you can see that these fish have a naturally short life span. The maximum age attained in Maine is about 6 years, but there are mighty few smelts this old swimming in our lakes. It can be safely stated that more than 90 per cent of the smelts in most of our waters are less than 3 years old.

Smelts are a popular quarry whether taken on a hook and line or in a net.

are likely to catch smelts at almost any depth. Wandering continues through the spring spawning season until restriction to deep water occurs in the summer.

MOST FRESH-WATER SMELTS in Maine lakes mature to spawn first in the spring of their third year of life (age 2) although some males may mature at age 1. The sex products are visibly maturing by late summer in the year prior to spawning and are quite well developed by early winter. The number of eggs carried by an individual female smelt varies with the size of the fish. Large smelts may average about 17,000 eggs per female. A 4½ to 5-inch smelt will contain between 6,000 and 8,500 eggs.

In a statewide survey of Maine smelt runs in 1958, it was found that 80 per cent of 114 runs studied were in progress during the first 10 days after ice-out. The earliest starting date was in February (55 days before ice-out), and the latest date for conclusion of a run was May 25 (31 days after ice-out). The average duration of the runs was about 10 days. The time the smelt runs took place could not be attributed to any single factor, such as water temperature or calendar date. The most important factor affecting spawning time is probably the increase in light in the lake after ice-out.

Smelt spawning occurs in lake tributaries ranging from the largest rivers to the smallest temporary inlets. Water temperatures at spawning may run from near-freezing to the mid-50's F, and egg deposition occurs over almost any kind of stream bottom. Smelt spawning in lake inlets usually occurs in the first 100 yards or less of gentle riffles although smelts are known to travel as many as five miles of deadwater to reach spawning riffles. Smelts are weak swimmers and poor jumpers, and falls or cascades as low as one foot will stop their upstream movement.

The onset of the spawning migration is signaled by arrival of loose groups of randomly wandering mature males which may move upstream a short distance before departing in late evening. The number of males entering the spawning area increases over a period of three to eight days before spawning begins. Males commonly make up a high proportion (up to 90 per cent) of smelts entering spawning areas in the early part of the runs. During the peak nights of spawning, the proportion of males may drop to 50 per cent or less, but it increases again as the spawning season draws to a close.

Larger and older smelts ("jacks") almost always spawn earliest in the season; and as the run progresses, spawners are smaller and younger. During the peak of the spawning season, smelts are not easily frightened by man's activity, but they are markedly "wilder" at the beginning and end of the season.

Smelts run up spawning tributaries rapidly in dense schools during the peak of the season. In the quiet water at the stream mouth, migrants swim at mid-depths; but as they reach the fast water, they

swim close to the bottom, often seeking protection from the current behind logs, boulders, or other obstructions.

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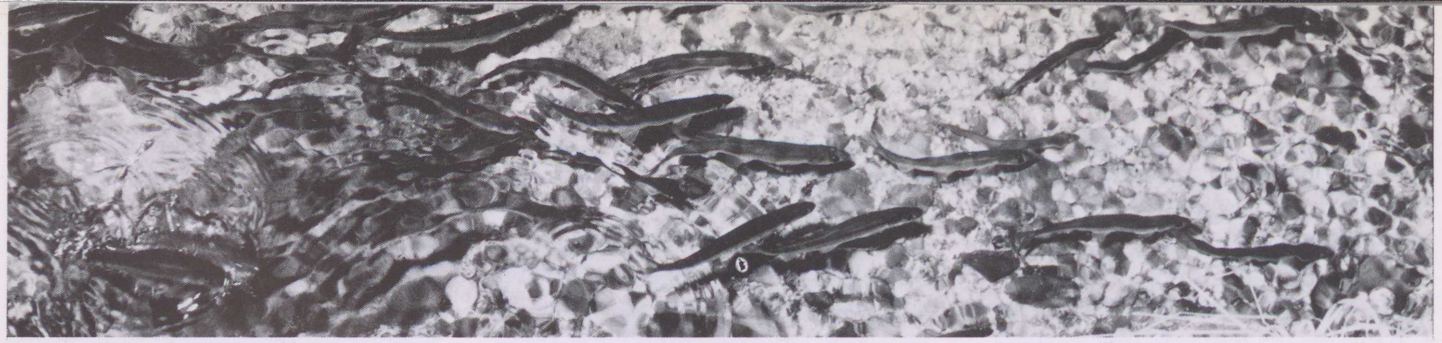


Smelts on their spawning run.

The average length attained by smelts at various ages in late summer is summarized below for Maine studies:

Age	Average total length (inches)
0 (under 1 year)	1.8
1	3.5
2	5.1
3	6.5
4	8.4
5	10.3

The existence of two "races" of smelts in the same lake has been a common belief for many years. It was also believed that there were two spawning runs in these lakes, with the large ("jack") smelts spawning first and the smaller ("needle") smelts spawning later. These observations are understandable; but, as I have already mentioned, the reason for the two size groups in the spawning run is simply that the larger, older smelts spawn first; and the younger, smaller fish spawn later.

However, some Maine lakes contain only "small" smelts and some contain only "large" smelts. A study was carried out to determine whether size and growth rate in these waters is controlled mainly by inherited (genetic) characteristics or by the nature of the waters in which they live (environmental factors). To evaluate this, we introduced smelts from several populations of known growth rate into new waters to determine whether growth of smelts would remain the same as in their home water or would change in their new environment.

In some transfers, "small" smelts from one lake became "large" smelts in their new habitats. In others, growth rates decreased; and in still others, average sizes and lengths of life span changed. The general conclusion reached was that the physical and biological environment exerts a far stronger influence on smelt growth than inherited factors.

SMELTS ARE VALUABLE and important residents of Maine lakes for several reasons. Probably most vital is their role as a food fish for our fresh-water sport fish populations. Smelts are the principal food of our native landlocked salmon, and salmon rarely attain their best growth rate unless smelts are present in adequate numbers. When salmon introductions are made in new waters, smelts are usually introduced, too, unless they are already present. Smelts are also commonly eaten by all of our other major cold-water game species (such as the trouts and togue), as well as by our warm-water species (bass, perch, pickerel).

Smelts provide good hook and line fisheries in many waters in both summer and winter. Tiny hooks baited with bits of smelt flesh are most effective. Ice fishing for smelts is most rewarding soon after freeze-up. Anyone who has not hunched over a smelt hole near an "airtight" stove inside a smelt shack is missing a warming recreational experience.

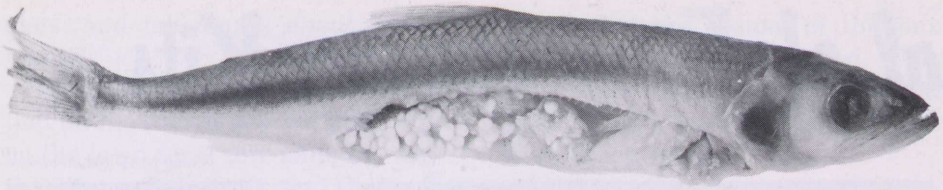
A different kind of smelt fishery is provided by dipping in tributaries during the spring spawning season. This is the only time some people ever see smelts. It has been said that you can give a perfectly normal person a dip net, put him on a smelt spawning run, and he is likely to go completely haywire. If you don't believe it, watch some time.

There has been a running controversy through the years on the effects of smelt dipping on smelt populations. From all of our research to date, there is no evidence that smelt dipping on the spawning run has a significant effect on smelt population abundance. There are so many other influencing factors that dipping has a relatively minor effect in most instances. The primary effect of dipping is probably destruction of habitat rather than removal of smelts or destruction of their eggs. Dippers commonly dump the contents of their nets, including gravel and other bottom materials, on stream banks. In extreme instances, mounds of gravel several feet high have been deposited on stream banks. This practice alters stream ecology to the detriment of fish and other aquatic organisms.

The practice of closing brooks to smelting is increasing, but the reasons for closure are more often social than biological. Vandalism, destruction of property, and littering by smelters have resulted in closure of many of their favorite smelt brooks.

The choicest and most effective bait fish used by Maine sport fishermen is probably the smelt. This fish is used in a variety of ways for both open-water and ice fishing. The most common methods are fishing with smelts as live bait while still-fishing in summer and winter and using them as sewed bait while trolling.

In whatever light you regard our fresh-water smelt, Mr. *Osmerus mordax* is here to stay. And, if you have not met him, I suggest that you strike up an acquaintance. ■



By William Woodward
Fishery Biologist

Smelt showing advanced infection of ovary. Photo by Dr. Alex O. Dechtiar.

Fish Parasites:

Glugea hertwigi

AMONG THE ANIMALS so small that a microscope is needed to see them are the protozoa. Certain protozoans cause malaria, sleeping sickness, and dysentery in humans; but man is not the only animal attacked by these tiny creatures. Virtually every animal in the world carries protozoa in its body. In this article, we will look at just one of the parasitic protozoa which lives in an important Maine fish.

In Maine, many of our inland waters are inhabited by the silvery, rainbow smelt, and the salt water strain of this same species inhabits the Gulf of Maine. The little fish may have other uses, but it is well known that the smelt is of considerable importance to man and the livelihood of many of our game fish.

We use smelt for food and as bait for fishing. They are also an important forage fish for the prized landlocked salmon, large brook trout, and certain other game fish, and are also a meal for some waterfowl.

The smelt is attacked by many protozoa, and one, a microsporidian, properly named *Glugea hertwigi* (glue-gee'-a hurt-wig-ee) is the one with which we are concerned in this article. *Glugea hertwigi* sounds like a gourmet food which a chef would prepare for a sumptuous meal; actually, the parasite considers the smelt a gourmet meal and depends on it for its existence.

The life of *Glugea hertwigi* in the smelt starts when the fish consumes a spore of the parasite, which is likened to a seed we plant in the garden. This spore usually travels through the stomach to the intestine or gut, where it is absorbed by the gut wall. This is where the trouble begins.

The spore breaks up and releases two more spores which invade a cell, the fundamental structure of life. These spores can be carried to other parts of the body to invade the liver, the eyes, the reproductive organs, and the gills. Although the spore may affect any part of the body, the primary place of the infection of this parasite is either the stomach or intestine.

The spore invades a living cell and lives at the expense of the smelt. Dividing and multiplying, the spore produces many more spores which create a growth or cyst on that part of the body on which it lives. The intestine, though, is where the smelt experiences the heaviest attack. The spores that invade the cells of the intestine create many cysts which may grow up to one-quarter inch long. These cysts sometimes block the passage of food the fish has eaten, and the smelt may starve to death. When the cysts break open — either in the intestine or when they are released after the smelt dies — many spores are cast into the water, and the cycle begins again.

Though the picture for the smelt is sometimes grim, as this parasite occurs in some of our inland waters as well as the Gulf of Maine, there are, nevertheless, many things in favor of the smelt.

The parasite must usually exist in very large numbers to cause great damage to a smelt population. Studies in the United States, Canada, Germany, and Russia have shown that smelt populations usually have only a mild case of *Glugea hertwigi.*

Another point in favor of the smelt is its high reproductive rate. Many sportsmen, fishing in our inland waters, have seen large schools of smelt rippling the surface. The parasite does not invade every fish. Even if a great number of smelt succumb to the parasite, there are usually a few hardy fish remaining to rebuild the population. Most likely, the smelt has harbored this parasite for a long time, and it, like humans, can usually survive a parasitic invasion.

How can we control *Glugea hertwigi* in the populations of smelt around the State of Maine? One way would be to eliminate completely the transfer of smelts from an infested water to one that is free of the parasite. This means that smelt from an infested water should not be used as bait, and any introduction of smelts into a body of water should come from a certified, disease-free source.

Another possibility in the control of the parasite would be to reclaim an infested pond by removing all of the fish including the smelt. This process would rid the pond of a vital link in the parasite's life cycle, whereupon another, disease-free forage fish could be restocked to restore the food fish population. It may be said, though, that no method is foolproof, for many uncontrollable factors in nature are working in favor of the parasite.

You may be wondering if the smelt is the only fish infected by *Glugea hertwigi.* Some studies report the parasite in the English sole, a flatfish of the sea. There are also reports which have shown that no transfer of the parasite occurs when infected smelt are eaten by larger fish. Most of the literature on the subject however, emphasizes that *Glugea hertwigi* is found mainly in smelt.

One may ask the question: Can man be infected by this parasite if he eats an infected fish? I have found no reference which states that a man can be infected with the parasite. Any fears one may have about eating infected smelts may be allayed by knowing that parasites are killed by proper cooking. ■

The Journal of Four Beaver Kits

By Warden John O. Leathers

Photo by Gene Letourneau

Warden Leathers supervises mealtime routine.

ALL IN ONE BREATH, my wife exclaimed, "Aren't they cute... where did you get them... an what are we ever going to do with them?" My three boys crowded around for a few minutes, then were off around the neighborhood to tell their friends the big news.

Thus began another spring and the annual parade of orphan baby animals and birds that wardens raise to be released in the wild or taken to the Fish and Game Department Game Farm in Gray. Usually these wildlife youngsters have been picked up by well meaning people who mistakenly think they are orphans simply because they don't see mother around. But this time, it was my own curiosity that put me in the position of being a foster parent.

Have you ever seen four baby beaver as they were born? Chances are, not many people have. On May 16, 1971, while in the Jo Mary Mountain area of Piscataquis County with Warden Inspector Lee Downs and my middle son, Ricky, we came upon a female beaver that had just been struck by an automobile. She was still alive when we arrived but soon passed on. I decided to check the size of the kits she was carrying, and you might say that was my first mistake. I soon had four fully formed, live beaver kittens in a rainshirt and was headed home.

After several phone calls, I became convinced that no one knew just what formula to feed a newborn beaver. I finally started with one that I had used with baby raccoons.

Dr. Malcolm Coulter at the University of Maine at Orono was of great help and comfort to this nervous foster father. Among other things, he suggested that I keep a journal of the kittens' activities. That was my second mistake. This article has been taken from that journal.

It was soon apparent that little beavers are born hungry. Every three hours, these little devils knew that it was time to eat. And did you ever try to pick the last unfed kitten out of a box at 3 a.m. with its mates mixing in with it? I finally solved this problem by putting on the floor those that were fed so that I could be sure they had all eaten.

One thing that came to my attention was that unlike most newborn animals, these beaver looked exactly like miniature adults. Even their front teeth were through the gums, although just barely. At three days of age, the weight of the four kits ranged from 13 ounces to 15 ounces. Body length averaged about 9 in-

ches, and tail length about 2 3/4 inches.

The little beavers were so active that on the fourth day we put them on the lawn for a few minutes, and their natural curiosity sent them off in all directions. Two of them set out to cut some of our rosebushes while another carried a clothespin in its mouth for a while.

When I put them back in their box, I added several small aspen branches. The kits got very excited and chewed on the leaves and bark, which seemed to show that instinct would do a lot for them. But then I had a terrible thought: after all the beaver dams that I had pulled out over the years, would I have to teach them how to *build* one?

One night I was called out on a complaint, and my wife, who works in a local hospital, was faced with a problem. Those kits had to be fed, and she had no idea when I would get back. I'll wager that those beaver are the only ones ever to eat two meals in a hospital and to be fed by nurses!

I tried more formulas and recipes than Betty Crocker ever heard of before finding one that seemed to suit them. Each day they were put in the yard while the kids in the neighborhood babysat, and people stopped in to exercise their camera shutters.

On June 1, their weights ranged from 1 pound, 6 ounces, to 1 pound, 12 ounces. Three weeks later, the smallest one was a little over 2 pounds but the largest had grown to 4 pounds, 12 ounces.

The kits were very energetic and much more stable on their feet than raccoons of the same age, but I was a little concerned about when they should be introduced to water. They were not very impressed with water in the sink, but after I got them into a box six feet by three feet with a large pan of water sunk in it, they seemed to know what to do. I soon found that the bottom of the box was best covered with sod. This gave them some natural cover and food, but it almost denuded a field next to my house.

In spite of the best care that we could give them, which included vitamins and antibiotics to keep the little critters healthy, we lost two of them in the first eight weeks. I was beginning to get a little desperate because no one seemed to have any facilities to take care of the two young beaver I still had. If they did not take to the wild, I was in big trouble!

About the first of August, I put the two kits in a beaver pond directly behind a camp occupied by an elderly couple, who fed the resident beaver each evening. I figured that the two groups would get together and the adults might take out adoption papers, but this did not work out. The mature beaver drove the kits away. That night they scratched at the camp door until they were let in. Several days of trying produced the same results, and during this time the smaller kit died.

I brought the one remaining beaver home, and he immediately took over the house. He liked bread. When he didn't get it in the evening, he would chew on the doorsill until he was let in; then he would go to the cupboard where the bread was kept, stand on his hind legs, using his tail as a brace, and cry until we fed him.

One day I had a very good idea. The Pleasant River is directly behind my house, and at this point the bank is almost vertical for about 20 feet. On several occasions, I had taken the kit to the river for a swim and waited for him. He just couldn't seem to climb that bank. This time I left him, figuring that either he would still be around when I came back, or he would revert to the wild. Ten minutes later, he came meandering across the lawn, up the steps, and into his box. For the next two weeks, I gave him three one-way trips to the river each day, and he was always back within a half-hour. The last recorded weight for this beaver was 9 pounds.

One very hot day, I put a wire pen in the yard over some tender weeds that the beaver liked. To this I added water and a piece of canvas to shade half of the pen, and the kit seemed quite content when I left for work. As this was much cooler than his other pen, I thought I had done my good deed for the day for what looked like our permanent resident. When I came in for supper, I had one of my boys take the kit to the river. It was over an hour before we realized that he had not returned. I checked along the shore for several days, and although I did not see him I found many small bushes that had been cut by a small beaver.

It just goes to show you that sometimes when you try to do a good turn, even animals don't understand.

The kits ranged from 3 to 5¼ pounds at six weeks of age.

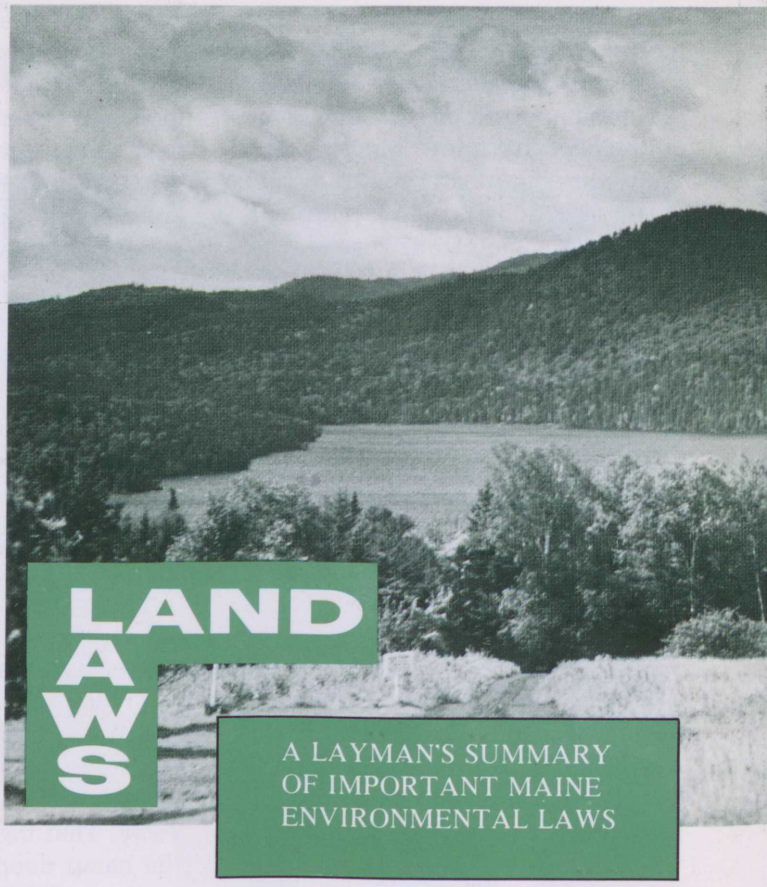
Editor's Note: From time to time, **Maine Fish and Game** *has had feature articles on some of Maine's environmental laws. These articles have gone into some detail on the laws, and we hope they have created a greater public understanding of the need for them and more compliance with their provisions.*

However, it's a fact that violations continue. And in many cases they are continuing simply because people are unaware of the law, what it says, or where they can go to find out more about it. To help overcome this problem, we are reprinting, with permission, portions of Land Laws *(copyright 1973, Landguard Trust, Richard L. Robbins, Executive Director, Box 681, Brunswick, Maine 04011).*

Landguard Trust, a non-profit corporation engaged in land use planning, prepared Land Laws *so that the layman will better understand the Maine laws most important to development and environmental protection.*

This list is not complete; there are other rules and laws which affect more specialized specific land uses. Nor is it a restatement of the law; it is merely a synopsis of Maine environmental laws. Professional advice and the assistance of the administering agency should generally be sought before application to a specific land use.

It should also be noted that Maine's land use laws are still evolving, and certain changes in this list can be expected.



Zoning and Land Use Control in the Unorganized Territory

Administered by: Maine Land Regulation Commission (LURC)

Statute: 12 M.R.S.A. 681-689 (See Commission Rules and Regulations)

Detailed rules and regulations control development in areas without municipal government. The Commission may regulate all development including:

> "any land use activity or activities directed toward using, reusing or rehabilitating air space, land, water or other natural resources."

LURC will map out specific areas called Land Use Guidance Districts. Only harmonious land uses will be permitted in those areas. Four major districts will be mapped. They include protection districts "where development would jeopardize significant natural, recreational and historic resources"; management districts including "those lands which are currently being utilized for commercial forest product or agricultural uses"; holding districts for future use; and development districts for residential, recreational, commercial or industrial use. Various subdistricts may also be created.

Detailed rules called Land Use Guidance Standards control the specific uses permitted in each district. Existing uses may also be regulated.

A Commission permit is needed for any new structure, or development in most districts. Subdivision of land requires Commission approval. In management districts there is no control of commercial forest product uses or agricultural uses.

By July, 1973 the Commission must complete a Comprehensive Land Use Guidance Plan, locate temporary Land Use Guidance Districts and adopt Interim Land Use Guidance Standards.

Great Ponds Protection

Administered by: Board of Environmental Protection (Department of Environmental Protection)

Statute: 38 M.R.S.A. 422

A permit is required "for construction and maintenance of causeways, bridges, marinas, wharves and permanent structures, or deposit of fill in, on, over or abutting on great ponds or for dredging in great ponds."

All inland waters in excess of ten acres and artificial water bodies of more than thirty acres where the shore is owned by more than one person are considered great ponds.

The Board of Environmental Protection must grant a permit if the applicant shows that the proposed activity:

a. will not unreasonably interfere with existing recreation, navigational, scenic and aesthetic uses;

b. nor otherwise unreasonably interfere with or harm the natural environs of the great pond or tributary, river or stream;

c. nor cause unreasonable soil erosion;

d. nor interfere with the natural flow of any waters;

e. nor create or cause to be created unreasonable noise or traffic of any nature;

f. nor harm any fish or wildlife habitat;

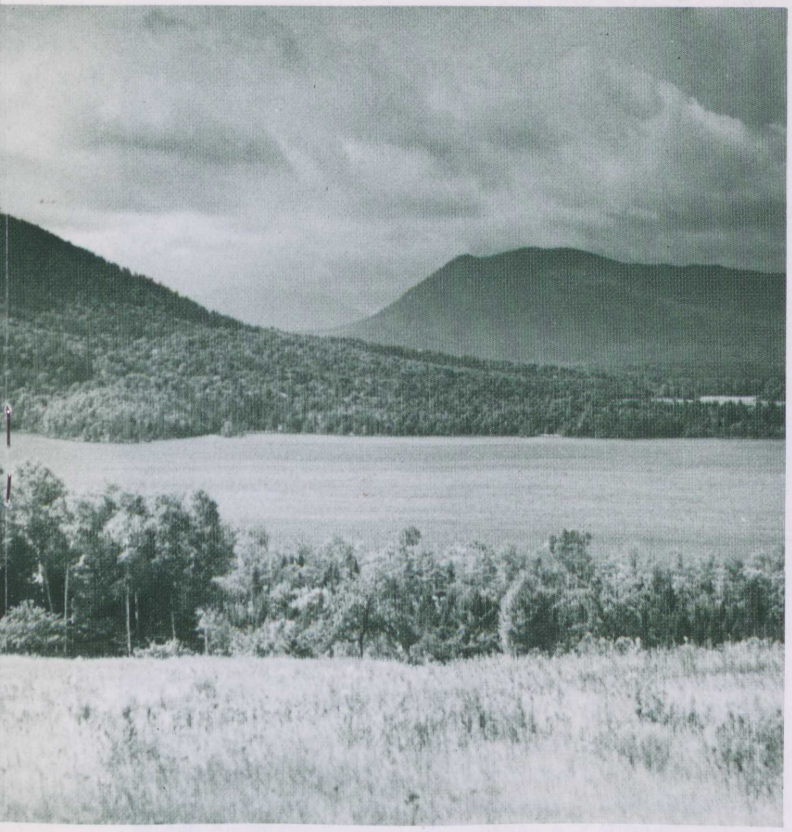
g. nor lower the quality of any waters.

Waterways Protection

Administered by: Commissioner of Inland Fisheries and Game

Statute: 12 M.R.S.A. 2203, 2205

No dam may be built in any waterway without first giv-



ing notice to the Commissioner. A permit is required to bulldoze, fill or dredge between the banks of any waterway capable of floating watercraft. No permit is needed for private crossings and dams altering less than 100 feet of shore or for certain other uses.

Wetlands Control

Administered by: Board of Environmental Protection (Department of Environmental Protection) and Municipality

Statute: 12 M.R.S.A. 4701-4709; 12 M.R.S.A. 4751-4758

No owner may fill, dredge, or alter any coastal wetland or drain or deposit sanitary sewage into or on any coastal wetland without a permit from the Board and approval of the municipality.

Coastal wetlands include "any swamp, marsh, bog, beach, flat or other contiguous lowland above extreme low water which is subject to tidal action or normal storm flowage at any time excepting periods of maximum storm activity." Owners are held responsible for any illegal activities on their land.

The Maine courts have held that owners must be compensated for any restrictions imposed for the purpose of "preservation" but not those aimed at preventing pollution or protecting public health. In 1971 the Legislature responded to this decision with a second Wetlands law. The Board is to set rules regulating wetlands alteration. Owners could appeal from the rules if the order deprived the owner of the reasonable use of the property or constituted the equivalent of a "taking without compensation." If the court found such a "deprivation" or "taking" and if specific health and environmental dangers were shown to exist the Board could negotiate for purchase or condemn the land by paying a just price.

Protection and Improvement of Water

Administered by: Board of Environmental Protection (DEP)

Statute: 38 M.R.S.A. 361-454

Surface waters and tidal waters are classified for permitted pollutant content and suitability for various uses. All discharges except private discharges of August 8, 1953 and public discharges of September 1, 1959 must be licensed and must be given the best practicable treatment. Exemptions expire in 1976. Water quality cannot be impaired by any discharges. A license is required for any new source of pollution or for any significant change in quantity or quality of those exempted discharges or when a transfer in ownership takes place. All exempted discharges must have been registered by March, 1973.

The Board may classify or raise the classification of any waters and the State Legislature must ratify that action at its subsequent session. The Board may recommend classification lowering. Private rights against a licensed discharge are limited.

Refuse may not be deposited on the banks of waterways. Mercury may not be discharged into water. High phosphate detergents are banned. By December 1, 1973 every solid waste disposal area must be at least three hundred feet from any classified body of water.

Site Location of Development

Administered by: Board of Environmental Protection (DEP)

Statute: 38 M.R.S.A. 481-488

All development including subdivision of land must be approved by the Board when the development:

a. otherwise requires a license from the Board (such as for waste discharge, waterway use, air pollution);

b. or, occupies a land or water area in excess of twenty acres;

c. or, contemplates removal of natural resources;

d. or, occupies a structure of over 60,000 square feet floor area.

Development must be approved before construction begins. Prior approval is also required precedent to sales of subdivided land. A subdivision is defined as:

> "the division of a parcel of land into 5 or more lots any one of which is less than 10 acres in size if said lots make up an aggregate land area of more than 20 acres and are to be offered for sale or lease to the general public during any 5 year period."

The Board must be notified before development begins. Within thirty days of notification the Board must approve or disapprove the development or schedule a hearing. The developer may request a hearing after decision.

A development or subdivision will be approved when it meets the following criteria:

1. The developer has financial capacity and technical ability to meet state air and water pollution control standards and has made adequate provision for solid waste disposal and control of offensive odors, and the securing and maintenance of sufficient and healthful water supplies.

2. The developer has made adequate provision for traffic movement of all types out of or into the development area.

3. The developer has made adequate provision for fitting the development harmoniously into the existing natural environment and the development will not adversely affect existing uses, scenic character, or natural resources.

Subdivision of Land

Administered by: Local Planning Board or Municipal Offices (supervised by Board of Environmental Protection (DEP), Attorney General.)

Statute: 12 M.R.S.A. 4801-4806; 30 M.R.S.A. 4956

In areas not served by public or private community sewer 20,000 square feet is the minimum lot size and 100 foot frontage is required if the lot abuts a public road, lake, pond, river, stream or seashore. Under-sized lots may be developed if the Board finds soils and sewage disposal methods satisfactory. Minimum road frontage may also be waived. Multiple housing or other intensive land use must have proportionately larger lots.

Lots acquired before October 1, 1969 and plans recorded prior to January 1, 1970 are exempted from the above requirements. Minimum frontage requirements apply only to lots sold after January 1, 1972.

All subdivision of land into three or more lots for purposes of "sale, development or building" must be approved by the local planning board or the municipal officers as to conformance with the following eleven criteria:

The proposed subdivision:

1. Will not result in undue water or air pollution;
2. Has sufficient water available;
3. Will not cause an unreasonable burden on an existing water supply if one is to be utilized;
4. Will not cause unreasonable soil erosion or reduction in the capacity of the land to hold water;
5. Will not cause unreasonable highway or public road congestion or unsafe conditions.
6. Will provide for adequate solid and sewage waste disposal;
7. Will not place an unreasonable burden on the ability of the local government to provide municipal services;
8. Will not have undue adverse effect on the scenic or natural beauty of the area, aesthetics, historic sites or rare and irreplaceable natural areas;
9. Is in conformance with a local subdivision ordinance, and comprehensive plan, if any;
10. Is being developed by a subdivider who has adequate financial and technical capacity to meet the above standards;
11. If situated within 250 feet of any pond, lake, river, or tidal waters will not adversely affect the quality of the water or unreasonably affect the shoreline.

Sale of two lots from a larger plot comes within the statute. Plots of unapproved subdivisions may not be recorded; public utilities may not service any unapproved subdivision; nor may any land be sold or developed.

Sanitary Regulations

Administered by: Department of Health & Welfare
Local Plumbing Inspector

Statute: 22 M.R.S.A. 1
32 M.R.S.A. 3351, State Plumbing Code (Esp. Article ii)

The State Plumbing Code prescribes rules for water supply location plumbing work, percolation tests and methods of storm water disposal.

Public sewage systems must be used if available. Acceptable private sewage disposal methods include septic tanks and subsurface absorption trenches, disposal fields or any other treatment works considered acceptable by the Department.

If daily flow of sewage exceeds 2000 gallons a professional engineer must submit a detailed plan for Department approval. Where daily flowage is less a septic tank must be located no closer than ten feet from the property line, eight feet from buildings, 100 feet from high water mark, 60 feet from tidal waters, and 100 feet from well. Similar guidelines are set for disposal trenches.

No disposal fields are permitted where the maximum ground water is less than two feet from the trench bottom; or slope is greater than 12 per cent. There are further requirements for disposal in man-made areas.

Comprehensive Planning and Zoning, Mandatory Shoreland Zoning

Administered by: Local Planning Board. (Supervised by Department of Environmental Protection, Maine Land Use Regulation Commission, State Planning Office.)

Statute: 30 M.R.S.A. 4961 - 4962
2 M.R.S.A. 4811-4814

Local zoning laws must be pursuant to and consistent with a comprehensive plan. The plan is loosely defined. It is a process as well as a document. It may include policy statements, standards, maps or data.

Zoning may follow strictly municipal guidelines. Zoning maps must be adopted as part of the zoning ordinance. Public utilities may be exempted from regulation but only by petition to the Public Utilities Commission. Zoning is merely advisory with respect to the state.

Any landowner or developer who petitions for rezoning must accompany that petition by a performance bond of twenty-five per cent of the estimated development cost. This bond is payable to the municipality if construction is not commenced within one year of the rezoning date.

Prior to June 30, 1973 municipalities must adopt subdivision and zoning controls for areas within 250 feet of any navigable waters. The Maine Land Use Regulation Commission and the DEP will adopt ordinances for towns that fail to regulate those areas.

Control of Pesticide Use

Administered by: Board of Pesticide Control

Statute: 22 M.R.S.A. 1451-1465

A Board of Pesticide Control regulates application of herbicides, insecticides, fungicides and other pesticides. The Board may control locations of application, chemical composition, purposes of application and sale. Applications within buildings, those within transportation devices and some Forestry Department uses are exempted.

The Board may exempt casual agricultural uses and arborist uses. A permit is necessary to apply the chemicals "to or in any river or stream or tributary thereof, or any great pond." ■

Photo © by Leonard Lee Rue III

A muskrat may be one of the furbearers that benefit from your marsh management efforts.

Improve Your Land For Aquatic Furbearers

By Peter A. Cross
Wildlife Biologist

WHEN WE HEAR the term aquatic furbearer, we usually think of the beaver, muskrat, mink, and otter. These are not really aquatic animals, as they do not live wholly in the water and can move around on land quite readily. They would perhaps better be called semi-aquatic or amphibious, for they are equally at home on land or water. They are, however, more adapted to living in water and are more associated with it than most mammals.

Improving one's land for aquatic furbearers has not received the same amount of attention as improving it for species such as farm game, upland game, or waterfowl. Many basic principles, however, carry over from one group to another. It is possible to give some basic guidelines, hints, and suggestions for this type of endeavor.

As with land everywhere, only a reasonable amount of improvement can be expected. The statement that each area has a certain carrying capacity for wildlife is just as true for aquatic furbearers as for upland game. The land will support so much wildlife and no more. We can increase this capacity some by improving the habitat. However, one of the basic determinants is the fertility of the land. Maine lands and marshes are not generally very fertile when compared to other sections of the country, and we cannot rightfully expect to produce the same densities of wildlife found elsewhere. We *can* improve our populations by reducing the limiting factors and more closely approaching the carrying capacity.

The most important requirement for managing aquatic furbearers is to have a wetland area or a potential wetland under your control so that you can make the necessary changes. Not all wetlands are equal in value; there are many in the state which have little value or potential. To start with, the area should not be highly acid or drain infertile land. This would put you at a disadvantage from the beginning. This is not to say that nothing could be done, but your chances are better in an area of average or better than average fertility.

An area which has potential as a marsh can be developed by impounding water in two ways. You can build a water control structure to impound water on the desired area. Before doing this, inquire of the regional fishery biologist to see if a permit will be needed for building the dam or require a fishway. The control structure should be designed to provide the maximum amount of shallow water area, along with some deeper water. This can be costly, however, and the second method may prove better. Beaver can be encouraged to move in and impound the water themselves. The Inland Fisheries and Game Department can help in this regard. We occasionally live trap beaver to remove them from areas where they are a nuisance, and we are frequently looking for suitable sites to release them. A call to your local warden or regional game biologist would be the first step in determining if your area would qualify. It should be added that on areas where we introduce beaver, we reserve the right to open or close the area to trapping, and we do not work on posted land.

Once a flowage or marsh is established, it is important to stabilize the water level. The structure should be able to hold the water which is needed and get rid of the excess. This feature should be designed into any man-made structure. On natural beaver flowages, it is harder, but devices can be installed which will keep the water at a certain level and not allow the beaver to keep expanding the flowage size unless it is desirable. The local warden or biologist can provide you with information about these devices. A stable water level is very important in a managed marsh, and the more you can reduce fluctuations, the better off the furbearers will be.

WHAT FURBEARERS can one reasonably expect on his marsh? If your marsh is an existing one, most likely the furbearers will already be present although you may be able to increase their numbers. Basically, to determine what is present will require a good survey of the marsh, keeping in mind the needs of the animals. Beaver will need water suitable to build a lodge, or a good bank to burrow into. There should be a good supply of hardwoods close to the water, mostly in the form of aspen, poplar, birch, maple, or willow. Muskrats will need good aquatic plants such as bulrush, cattail, horsetail, burreed, duck potato (pickerel weed), sago pond weed, wild rice, willows, sedges, and smartweeds. A pond devoid of aquatic plants is not likely to harbor muskrats. A good supply of fish will be attractive to mink and otter. Amphibians and crayfish would be beneficial. (The otter may find muskrats to be tasty, too, but will not materially affect muskrat numbers.) One might expect raccoons and weasels to be attracted to a good marsh as they look for food there.

There are a great many physical signs to look for during your survey. You may actually see the animals themselves, or you may see only signs of them. The beaver will probably have a dam and lodge. Almost always, there will be cuttings along the edge to denote his presence. Muskrat build smaller houses than beaver and use the available vegetation. Many times they also build feeding platforms. Otter may give their presence away by making slides in the snow or on mud banks. Through the course of a year, with careful and repeated observations, a landowner should be able to determine the species and number of furbearers present.

It is difficult to list specific things you can do to improve your marsh. Each marsh is different and will require a little different approach. As has been mentioned, a stable water level is probably the most important management technique. This will assure water throughout the summer for the animals. At the same time, it is important that the marsh be able to rid itself of excess water in a hurry. This will keep the beaver and muskrat from drowning or being forced from their homes in winter or spring.

Anything you can do to encourage young stands of hardwoods around the edge of the marsh should be helpful to beaver. Removing competing softwoods and some of the older hardwoods, if they are numerous, would be of benefit. You could practice some species improvement, also, by cutting out species which are less desirable in favor of preferred species.

One question which is often asked about marshes, and has probably occurred to you, concerns the planting of aquatic vegetation. At first glance, this would appear to have merit. And it would if it worked. The Fish and Game Department made extensive tests of this technique with very poor results. The common denominator for failure appears to be the acidity of most Maine waters. In most cases, the water is too acid to introduce the desired plants into and expect them to thrive. Generally, it was found that if conditions were suitable, the plants were there naturally.

If you really wish to manage your marsh to get the maximum potential of the area for the longest period of time, you will have to practice some sort of population control. All wildlife populations have the potential to increase at very rapid rates. Something has to keep the numbers in check, and this is quite often the habitat itself. Other natural forces will keep the population under control but sometimes only after the habitat has been almost destroyed. Muskrats have been known to increase in numbers to the point where they cause an "eatout," destroying almost all the vegetation in the marsh. Beaver, too, can overuse their food supply and reduce the carrying capacity of the marsh until it has time to recover.

If the populations are kept at lower levels, the useful period of the marsh can be extended for long periods. Generally, the best way to control the population is through trapping. This may seem unnecessary and cruel to some, but it is best for the animals and best for the marsh. You can figure about how many furbearers are on the marsh and how many are needed to maintain the population. The remainder can be removed. You may do it yourself and get an additional benefit from your management program. If you are not so inclined, a local trapper will probably be happy to do it for you. Your district warden can put you in touch with one if you do not know one yourself.

It should be mentioned that many of the furbearers will not use just *your* marsh. Unless you have extensive land holdings, your marsh will probably be a part of the home range of some furbearers. The beaver and muskrat probably will live exclusively on your marsh; but for others, such as the otter and mink, your marsh will probably be a part of the home range which may cover many miles.

The best marsh is probably one that is disturbed the least. You should temper your activities to disturb the wildlife as little as possible. Swimming, motor boating, and improvements such as weed control, brush control, and cleaning up to improve the view would work against your purposes. The best marsh is one left in a natural state with only essential improvement conducted.

It should be pointed out that a good furbearer marsh is going to be a good wildlife area. If aquatic furbearers find it attractive, so will waterfowl, deer, moose, nongame animals, and fish. You may end up with many extra benefits.

Maine's Fishery Regions:

FISH RIVER LAKES

By Peter M. Bourque
Regional Fishery Biologist
and
Steven A. Timpano
Assistant Regional Biologist

Numerous unspoiled lake and river systems and "The Big Woods" are features of the Fish River Lakes Region which have long attracted sportsmen.

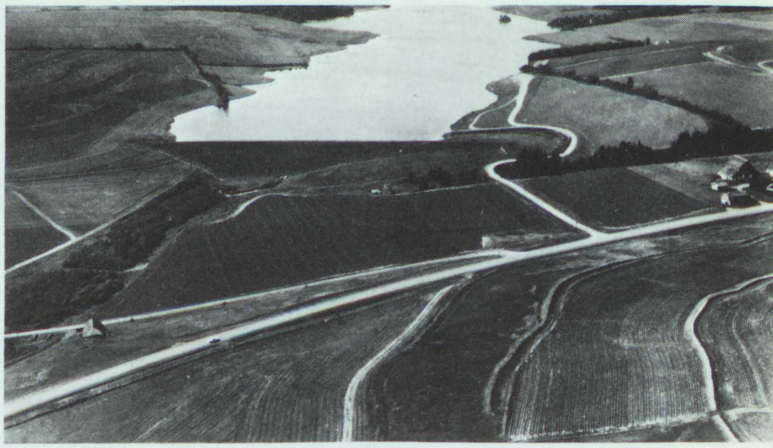
THE FISH RIVER LAKES REGION is headquartered in the small town of Ashland, with the regional office just a short distance from the banks of the Aroostook River. Ashland sits on the border of the two distinct land uses in this area. Immediately to the east and running north and south across the length of the region lies a vast expanse of agricultural land commonly called potato country or "Spudland." Immediately west of town are the large timber company holdings commonly called spruce-fir country or just "The Big Woods," or backcountry.

The Fish River Lakes Region includes Aroostook County, large portions of Piscataquis and Penobscot counties, and a small portion of Washington County. In total area (land and water), this is the largest of Maine's six fishery regions, encompassing better than five and one-half million acres. This is nearly the size of the State of New Hampshire. This area includes the following major drainages: St. John River, Allagash River, Aroostook River, Fish River, East Branch Penobscot River, Mattawamkeag River, and Meduxnekeag River. There are approximately 500 lakes and ponds 10 acres and larger, which total approximately 145,000 acres of water. Three hundred waters have been surveyed in the region totaling about 135,000 acres, or better than 93 per cent of the total water area.

These investigations are performed by trained fishery biologists and include information on the physical, chemical, and biological features of the lake or pond. In addition to the waters of more than 10 acres, there are several hundred of less than 10 acres, which comprise only a small portion of the total water area of the region.

Because it has long periods of ice cover and short, cool summers, and lacks warm-water fish competition, the Fish River Region is primarily suited to cold-water fishery management. Its cold-water fisheries include landlocked salmon, brook trout, lake trout (togue), blueback trout, lake whitefish, and smelts. Most of the lakes and ponds have populations of one or more of these species.

The landlocked salmon, probably the most difficult species to manage in Maine from a biologist's point of view, provides the most sport for springtime anglers. The Fish River chain of lakes, especially Square, Eagle, and Long lakes, provides the finest *native* salmon fishing in the state. Other lakes that provide some pretty fair salmon fishing include Munsungan Lake, Matagamon Lake, Pleasant Lake, Lower Hudson Pond, and Togue Pond. A good



Extensive timberlands in the western portion and vast agricultural lands to the east are the predominant land uses in the region. Illustrating these uses are aerial photos of the country around Rowe Lake and Billings Pond (left) and Trafton Lake (above).

portion of the fishing in the last four waters is provided by hatchery-reared salmon.

The lake trout, or "togue," as it is more commonly called in Maine, provides angling both summer and winter. With the exception of a stocked population in Nickerson Lake, New Limerick, all of the north country's togue lakes are west of Ashland.

The best togue fishing, and probably the most popular, is found in those lakes both in and around the Allagash Wilderness Waterway. Lake fishing begins early in this area, before the ice has left the lakes. As in Canada, portions of the Allagash River, especially the thoroughfares between the lakes, provide splendid angling. Later, as the ice cover leaves the lakes, waters such as Chamberlain, Big Eagle, Umsaskis, Long, and Allagash lakes provide some surface trolling for a few days to a week. Soon after this, the deep-dwelling lakers are down in their summer niches until October spawning season rolls around.

Other waters in the Allagash drainage that provide togue fishing are Ross, Priestly, Churchill, Big Indian, First, Second and Third Musquacook, Spider, Cliff, Hamock, Togue, and Clear lakes. Second Musquacook, Umsaskis, and Haymock lakes are presently being stocked with fin-clipped togue on a maintenance basis in an effort to bolster their fisheries. Clear Lake is considered relatively slow fishing but affords the angler the opportunity to catch a togue in the 10-20 pound class.

In the East Branch of the Penobscot River drainage, Telos, Webster, Scraggley and Matagamon lakes supply togue fishing both summer and winter.

Munsungan Lake on the headwaters of the Aroostook River is the only significant lake trout water in this drainage.

Fish River Lake, Second and Third Chase, and Carr ponds all contain fairly good native togue fisheries in the Fish River Drainage. Through a recent reintroduction of lake trout (1969 thru 1973), St. Froid Lake is again providing togue for fishermen. Early checks have revealed exceptionally good growth on the initial stocking in 1969. St. Froid Lake is the only togue lake in this drainage that is open to trout and salmon fishing both summer and winter.

In the extreme northern tip of the state, Beau and Glazier lakes on the St. Francis River have togue fishing.

Of the several lake trout waters open to fishing in February and March, Chamberlain and Big Eagle lakes in the Allagash Wilderness Waterway receive the most pressure and provide quite a cold weather "hotspot." Most of the fish are taken by "jigging" lures close to the bottom.

THE BROOK TROUT is the most widely distributed cold-water species in the region. Practically all waters that are physically and chemically suited for brookies in the Fish River Region have some degree of trout population—from small, remnant populations to thriving, pure populations. Again, it is easy to draw a distinct line through the region when discussing trout management. Because of the population density, accessibility, and land use east of Ashland, the majority of the trout ponds are waters that have been reclaimed and hatchery-trout stocked.

Unlike the sterile ponds in the "Big Woods," these ponds are highly fertile. The limestone underlying many of them, coupled with a high degree of inorganic fertilizer run-off from the potato fields, causes many of these ponds to be highly alkaline and "good growers of brookies." Most produce fast spring fishing for all types of anglers. As the water warms and the trout go down, fishing gets increasingly more difficult. However, an experienced angler who knows how to operate a sinking line and wet flies can come away with attractive trout catches almost any time of the summer.

Southwest of Ashland, from the northern portion of Baxter Park to the top of Maine, many lakes and ponds supply top-notch squaretail fishing. Except for a very few, all these waters have strictly wild (native) brook trout populations. Some ponds provide fast fishing for 7-10 inch brookies, while other ponds commonly have slower fishing but generally reward the angler with 2-4 pound fish.

Most of the rivers, brooks, and streams in the Fish River Region supply fishing in varying degrees. The majority of this fishing is for the native brook trout. The larger rivers — Aroostook, St. John, Fish, Allagash, Big Black, Little Black, Big Machias, and East Branch Penobscot — produce good fishing in the spring and fall. Many of these waters yield attractive size squaretails during these periods when the water is cool and the flows substantial.

However, as water flows drop and water temperatures rise, the trout find their way into springholes, and the major portions of the rivers become habitat for the competitive species. At this time of year, unless an angler can seek out the springholes, trout fishing may be very frustrating.

But the trout fisherman need not hang up his rod because the river fishing gets tough. There are literally hundreds of smaller brooks and streams in this region that yield brookies throughout the open water season. Many of these streams are loaded with populations of small trout that up until a few years ago were not available to the angler because of the 6-inch legal length limit.

In the early 1960's, Fishery Biologist Kendall Warner studied brook trout populations in 38 brooks and streams in northern Aroostook County. The brooks studied were both lightly fished "back-country" brooks and those in more accessible agricultural areas. Warner concluded that the trout in these brooks generally have a short life span, a slow growth rate, and an apparent high annual mortality rate. Only 8 per cent of the trout sampled exceeded the legal length of 6 inches. These factors prohibited anglers from using the majority of the trout population under a 6-inch legal length limit. Most of the trout in these brooks apparently died of natural causes before becoming vulnerable to legal angling. In the spring of 1970, by virtue of a legislative act, the 6-inch limit was removed on trout in brooks and streams.

Although brook trout constitute the majority of northern Maine's flowing water fisheries, some river fishing for landlocked salmon is available in the spring and fall. Again, probably the most well known areas for catching an attractive size salmon are some of the thoroughfares on the Fish River chain of lakes. The lower portion of the Fish River and the St. John River in the Fort Kent area are both salmon producers. For the past several seasons, the East Branch Penobscot River below Matagamon Lake has been known as a Memorial Day weekend hotspot for salmon.

At this point, we would be remiss not to mention that the Aroostook River once supported a substantial Atlantic salmon run. The river is potentially one of the best Atlantic salmon rivers in Maine, but in the past 65 years, runs have declined almost to extinction. Severe pollution in the Aroostook and St. John rivers, and the Tinker hydroelectric dam at Aroostook Falls, New Brunswick, are the major deterrents to re-establishment of an Atlantic salmon run in the Aroostook River. With present plans for pollution abatement and upgrading of the water quality in both the Aroostook and St. John rivers, sea-run salmon may again become a part of the Aroostook River fisheries.

In addition to the salmon, togue, and trout, Maine's northernmost fishery region has three other cold-water species that are not quite so prominent but do supply some degree of sport fishing — the blueback trout, lake whitefish, and smelt.

The blueback trout is unique among Maine's trout and salmon. The species was considered extinct after 1904 but was "rediscovered" in northern Maine in 1948. (See **Maine Fish and Game** Fall 1966.) Bluebacks are considered close relatives to the Sunapee trout, the red trout of Canada, and the Arctic char. Before 1969, when a transfer was made to southern Maine, bluebacks were found in only eight ponds in the two northernmost fishery regions.

In the Fish River Region, these fish are native to four waters in the Red River area — Black Lake, Deboullie Lake, Gardner Lake, and Pushineer Pond. One other pond in the region, Big Reed Pond — just south of Munsungan Lake in Piscataquis County — reportedly produces bluebacks up to 18 inches long.

Not as well known as a game fish but one of the sportiest and probably the most savory cold-water fish is the lake whitefish. Recently, the Legislature established an eight fish limit on this fishery. Whitefish are generally a school fish and at times provide attractive angling both summer and winter. In this Region, almost all the lakes in the Allagash River drainage provide both goodly numbers and nice-sized whitefish for those who try for them.

The lake whitefish will supply some fast fishing on a dry fly shortly after the ice has gone out. In the late summer and winter months, these flashy fish bring fast action to the "jig" fisherman who normally fishes close to the bottom with lures. On days when laker (togue) fishing is slow, the lake whitefish has proven to be a big bonus. The Allagash waters generally yield whitefish around 18 inches and weighing two pounds.

Smelts provide plenty of sport for a special group of fishermen. In summer and winter, these anglers spend many patient hours in a boat or in a smelt shack handlining smelts off the lake bottom.

Popular regional waters for smelt fishing are Pleasant Lake in Island Falls, Portage, St. Froid, Eagle, and Long lakes in the Fish River drainage and Squa Pan, Millimagassett, and Millinocket lakes in the Aroostook River drainage.

Even while many of the north country lakes may still be partially ice-covered, the cry finally comes: *"I heard the spring peepers last night, and the smelts are runnin' at Squa Pan Lake. Grab yer smelt net and let's go get a mess!"* For people in northern Maine, that's the first harbinger of spring. Maybe old man winter is finally going to give up his grip! A fry pan full of freshly-dipped smelts sizzling in salt pork should appease any man's appetite.

EXCEPT FOR LARGEMOUTH BASS, the Fish River Lakes Region can offer a fisherman the same species of warm-water fish found in the rest of the state. This statement has to be modified to point out that such species are present only in the southern part of the region and often co-exist with salmon fisheries.

There are three basic limitations for warm-water fish in this region: *One*, with long winters and short, generally cool summers, conditions are not ideally suited for production of large numbers of attractive sized warm-water fish. They survive and multiply all right, but growth is apt

to be slow, often resulting in stunted populations. *Two*, warm-water fish and salmonids—especially brook trout—do not thrive equally in the same lake. For example, brook trout can't compete successfully for food and habitat when pickerel or bass are present. A remnant population of brook trout may be in a bass lake, and occasionally a lunker brookie will be taken, but numbers are not such as to produce an attractive fishery. Which brings us to point number *Three*, angler acceptance of warm-water fish. Northern fishermen would generally rather fish for trout and salmon than bass and pickerel. Warm-water species are definitely underharvested at present in this region, and will be until more people become acquainted with and accustomed to fishing for them. This is an over-simplification, naturally, but will serve as a summary of the philosophy of warm-water fish in northern Maine.

So, on with the definition of what is available and where: Only three lakes north of an east-west line across the region at the level of Houlton contain bass and pickerel. Seboeis Grand Lake is the northernmost and supports a good fishery for smallmouth bass and pickerel. Bass were introduced successfully starting in 1958 by stocking a total of 63 adult fish over a three-year period. Since then, smallmouths have extended their range downstream into Snowshoe and Whitehorse lakes. Snowshoe Lake also has a fair salmon fishery in the spring. Whitehorse Lake habitat is better suited to pickerel, and they provide the predominant fishery.

Going south of our imaginary east-west line, one finds thriving pickerel populations in several small ponds in New Limerick, a place for ice-fishermen disillusioned with the slower togue fishing on nearby Nickerson Lake. Pleasant Lake in Island Falls has a growing population of smallmouth bass in addition to the salmon mentioned earlier. These bass are not of record breaking size but are numerous enough to provide a lot of fun.

Mattawamkeag Lake, also in Island Falls, is the real gem for species diversity. At the right times of year, there are fisheries for salmon, brook trout, smallmouth bass, pickerel, white perch, and lake whitefish. Bass and pickerel are its forte, but the others are there to provide something for everyone!

Wytopitlock and Molunkus lakes are good for pickerel, white perch, and bass. Molunkus Lake also has a small native salmon population which the Fish and Game Department has been trying to boost with salmon and smelt stocking since 1966. In 1971, larger-sized salmon were released in hopes of avoiding fierce pickerel predation on newly released fish. Monitoring the results of these stockings will further our knowledge of relationships of salmon and warm-water fish in this northern region.

The Salmon Stream lakes have relatively unexploited pickerel which could produce fast ice-fishing for anyone so inclined. And, last but not least, Upper and Lower Hot Brook lakes on the Aroostook-Washington County border are good producers of smallmouth bass, pickerel, and white perch.

An as yet unmentioned warm-water species which is much maligned and holds a lower place of esteem to the northern fisherman than even the lowly sucker is the yellow perch. *Ubiquitious* is the best word to describe yellow perch in Maine, and the Fish River Lakes Region is no exception. All major drainages in the region except the Allagash have yellow perch. Fishermen who berate the presence of yellow perch are justified when the effects of perch on a pristine trout fishery are concerned. Brook trout production usually drops markedly with the introduction of perch. On the other hand, if we have yellow perch and must live with them, let's use them! Surprisingly, even in northern waters, yellow perch sometimes grow to 12 or 14 inches in length, a size worthy of consideration by any angler. If you haven't tried eating yellow perch, you're probably in for a pleasant change of taste!

Another fish low on the average northern angler's totem pole is the bullhead or hornpout. Granted, they're not attractive to look at (unless you're another hornpout), but ugliness, like beauty, is only skin deep; and peeling the skin off reveals a deep orange flesh which is considered by many second-to-none for taste. At any rate, for those anglers who esteem the humble hornpout, they are available in good size and numbers in many of the lakes and ponds in the Fish River Lakes Region.

Lake trout are sought both summer and winter. Assistant Regional Biologist Steve Timpano checks one caught last winter at Big Eagle Lake by Sherman Hallowell of Carmel.

A REVIEW of fishery potentials for an area wouldn't be complete without discussing some of the current and potential problems of management. Under this heading, as it pertains to the Fish River Lakes Region, habitat disruption or destruction is the primary consideration. Fortunately, proper land use management can largely alleviate habitat degradation, especially in an area with

to be slow, often resulting in stunted populations. *Two*, warm-water fish and salmonids—especially brook trout—do not thrive equally in the same lake. For example, brook trout can't compete s
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fairly low population density and development such as we have here.

Over the years, logging practices have had a pronounced effect on stream fisheries in the "big woods" portion of the region. Bulldozing stream channels to permit pulp driving altered much brook trout habitat. This practice has been discontinued, but many of the old scars remain: straightened sections of streambed with little cover, old water-control dams blocking fish movements, and accumulations of bark and other debris on river and lake bottoms.

Nature has a way of restoring itself, but it takes time. Over a period of many years, spring freshets dig pools and create riffles in stream beds, old dams rot and crumble, and debris slowly rots and is washed away or becomes covered over.

A more pertinent logging problem now is sedimentation in streambeds and lakes, resulting from runoff and washing of roads and skidder trails. Careful construction of roads and bridges, reseeding unused roads, and taking special consideration of timber harvesting on steep slopes can minimize siltation greatly. Leaving sufficient buffer strips of undisturbed vegetation along waterways helps to control erosion and also shades streams to maintain cooler water during summer. An added bonus of leaving such cover strips is the protection of important wildlife habitat essential to many of our northern birds and animals. Multiple purpose land use, including timber harvest and fisheries, *can* be compatible.

The considerations of logging problems — though they differ somewhat — can be applied equally to farming areas of the region. This is potato country, and large acreages are cleared for potato production. Improper methods of plowing, planting, and harvesting can result in the erosion of tons of topsoil from a single acre during a single thunderstorm! Of course, this is a loss to the farmer in terms of remaining soil quality and reduced future harvests, and it also results in the destruction of stream habitat for fish.

On the farm scene, too, are the use and misuse, of pesticides. Fish kills due to pesticides reaching the water have occurred over much of the farmed part of the region. Accidental spillage during sprayer filling operations, leaking pesticide containers left beside brooks, even field runoff when heavy rains follow proper spray application have all been cited as causes of fish mortalities. Some insecticides and weed killers used today are extremely toxic to fish in very small amounts; great care has to be taken in their use near brooks and streams. Various agencies have proposed guidelines for the handling, use, and storage of pesticides. Following these guidelines carefully might save the fish in a favorite stream!

Pollution of river streams from domestic sewage and industrial developments is nowhere near the problem here as it is downstate. Again, this is due to the low population density of the area. Where problems do exist — and there are several — the results are similar to pollution anywhere else. Potato processing plants and pulp-paper mills require a lot of water, most of which is returned to rivers. If treatment facilities are inadequate, this water carries a load of chemicals and byproducts which may make the water unsuitable for fish. Add domestic pollutants from municipalities to this, and you really can get a mess! Noteworthy examples in the Fish River Lakes Region where pollution has degraded water quality below that suitable for gamefish are the Prestile Stream, lower Aroostook River, and the lower section of the St. John River. Other rivers in the region are polluted to a lesser degree but generally provide some fishing at certain times of the year. Various treatment facilities for these waters are in the planning stages and if carried out could restore water quality to suitable levels for trout and salmon in the near future.

Rivers have the capacity of cleansing themselves quite rapidly once the source of pollution is removed, but unfortunately, lakes do not all share this cleansing capacity. The cry of *cultural eutrophication* or enrichment of lake waters has focused the attention of many organizations and lake associations on preventing the problem before it occurs. Camps and their associated septic drainage can enrich water to the point of serious algae buildups and associated fishery complications. Currently, the Maine Department of Environmental Protection is monitoring water quality on Long Lake, St. Agatha, for euthrophication. Water analysis of 13 other lakes in the region is carried out once each year by Fish and Game personnel for the same purpose. It is hoped that lakeshore development in the Fish River Lakes Region can take a lesson from southern areas of the state and avoid creating "green water."

Water storage dams can have an effect on the fishery in a lake through fluctuating water levels. For example, togue in this region tend to spawn in shallow water even though young and adults live in the depths. If lake levels are high at the time of spawning and are allowed to drop later, many of the eggs can be exposed and destroyed. Such was the case at Eagle Lake in the Allagash Wilderness Waterway where lake levels are affected by a dam on Churchill Lake. Co-operation with Allagash Waterway personnel has been obtained for minimum water levels behind the dam. Togue were found spawning in one to six feet of water in 1971. Togue reproduction should be enhanced by holding a minimum water level during spawning season and never allowing the level to drop below this minimum during the winter. Similar co-operation with dam owners on other togue waters has been secured

Another aspect of dams affecting fisheries occurs when impoundments create large areas of shallow water. If undesirable species of fish are present, a population explosion usually results, producing competition for food and living space with more desirable trout and salmon.

Public access to lakes and ponds in the Fish River Lakes Region is generally good. Most of the larger lakes have boat launching sites and parking areas, usually maintained by a nearby town or local sporting club. There is considerable room for improvement on many smaller lakes and ponds. Few ponds are actually off-limits to the fisherman, thanks to co-operative landowners, but this situation may not last indefinitely. Changing land ownership and development of lake and pond shorelines may ignore the fisherman and not provide for free public access. If you can see such a situation developing on your favorite fishing water, check into the prospects of obtaining a

deeded right-of-way, through your town or local sporting club.

IN ADDITION to routine management, basic research on fisheries constitutes a good portion of the regional biologists' work load. Past projects in the Fish River Lakes Region included an in-depth study of native salmon in the Fish River chain of lakes, small trout stream population studies, and DDT-trout relationships. The latter work was part of a study of the effects of aerial insecticide application for control of the spruce budworm. This work has been carried on over the years for a variety of chemicals since DDT was recognized as a hazard to the environment.

No major research projects are underway in this region at present, but contributions to state-wide research are on-going. Salmon waters investigations include fishermen creel census, habitat, competition, and age and growth studies on stocked and wild salmon in a variety of waters. From the nearly ideal conditions in Pleasant Lake, Island Falls, to very marginal habitat such as Spaulding Lake, Oakfield, data evaluation can help biologists formulate stocking policies to provide the best fisheries.

Brook trout stocking policies have also undergone changes over the years and will continue to change as more information is gathered. Creel census of fishermen during May and June is often the best method of obtaining such information. If you're fishing one of the region's reclaimed ponds such as Echo and Hanson Brook lakes in Presque Isle; Carry Lake, Littleton; or Timoney Lake, Oakfield; and a clerk comes along to ask how long you've been fishing and what you caught, answer as best you can. Analysis of this kind of data shows us trends in a fishery and will help in revising stocking policies in years to come. Under more intensive study, Black Lake, Fort Kent, is part of a statewide small trout pond research project. Over a period of years, varying stocking rates will be the subject of close scrutiny in six such ponds across the state. Spring trapnetting for population estimates, creel census of anglers, and fish growth rates and carry-over are parts of this study, designed to provide better fishing through optimum stocking.

Chemical reclamation has been carried out on 21 lakes and ponds in the Fish River Lakes Region. This is the useful management practice of eliminating competing fish species and stocking game fish back under ideal conditions for growth. Timoney Lake, Oakfield, is an excellent example of a successful reclamation; it was treated in 1957, and no species of fish other than brook trout have become established since then. Other ponds have been reclaimed twice following re-establishment of competing species, and some have been abandoned because of unsuitable conditions; but on the whole, reclamations have been useful in providing some excellent fishing in otherwise "trout poor" sections of the region. Sometimes, such as in Number Nine Lake, reclamation and restocking will provide a self-sustaining fishery, but it is usually necessary to supplement natural reproduction with stocked fish. Various sporting clubs in the region deserve a heartfelt word of thanks for donating time and materials to build barrier dams and provide public access, making many of these reclamations possible. With similar co-operation in the future, perhaps we can make more "silk purses from sow's ears!"

CANOE TRIPS in the Fish River Lakes Region are many and varied, as the area is blessed with extensive river systems. Novice and expert alike can find suitable water to test their skills, from family groups seeking an outing on a quiet river to the expert challenging the rapids. The list on this page is only a partial offering of what is available; many smaller rivers and streams which are navigable in the spring are not included. Nor does it place any degree of difficulty on the trips listed. Most of these are strictly river trips, but some include the interlude of lakes along the way. All, however, offer the solitude and beauty of the wilderness available by no other means; slipping quietly along with the current, a part of your surroundings, is a relaxing experience.

TRIP	COUNTY	BEST TIME FOR CANOEING	LENGTH (MILES)
Aroostook River (Mooseleuk Lake to Ashland)	Aroostook	May 15-July 15	48
Allagash River (Churchill Lake to mouth)	Aroostook	May 15-Sept. 15	50
St. John River (N.W. Branch to Big Rapids)	Aroostook	May 15-June 20	72
St. Francis River (Beau Lake to St. Francis)	Aroostook	May 15-July 15	18
Big Black River (Bridge in T.14, R.15 to mouth)	Aroostook	May 15-June 15	18
Little Black River (Bridge in T.19, R.12 to mouth)	Aroostook	May 15-June 15	23
Fish River (Fish Lake to Fort Kent)	Aroostook	May 1-June 30	56
Big Machias River (Big Machias Lake to mouth)	Aroostook	May 15-June 30	29
East Branch Penobscot River (Matagamon Lake to mouth)	Penobscot	May 15-July 15	47
West Branch Mattawamkeag River (Route 11 bridge to Haynesville)	Aroostook	May 15-June 15	36
Mattawamkeag River (Haynesville to Mattawamkeag)	Aroostook & Penobscot	May 15-June 30	46
Webster Brook (Telos Landing to Matagamon dam)	Piscataquis & Penobscot	May 15-June 30	22
Sebois Stream (Sebois deadwater to mouth)	Penobscot	May 15-June 15	20
East Branch Mattawamkeag River (Oakfield to Haynesville)	Aroostook	May 15-June 15	24

Maine Forestry Department photo.

The Fish River Region offers quite a number of canoe trips of various lengths and degrees of difficulty. This scene is on the Allagash River at Chase Rapids.

From these basic trips, longer or shorter trips can be made by starting or ending at different access points. On the larger rivers, 18'-20' canoes are preferred although not absolutely necessary. If you're so inclined, take your fishing gear along. All trips offer brook trout during the dates listed, and some also cover salmon and togue waters. One item to take special note of is a change in the laws on floatation devices. *All* watercraft, now including canoes, have to carry at least one U.S. Coast Guard approved buoyant cushion or life-jacket for each person aboard.

Items not strictly concerned with fishing but of interest to sportsmen visiting the Fish River Lakes Region include the Allagash Wilderness Waterway, Forest Service campsites, and the network of logging roads in the "Big Woods."

"The Allagash Wilderness Waterway was established by legislative action in 1966 to 'Preserve, protect, and develop the natural beauty, character and habitat of a unique area'". So begins the brochure published by the Maine State Parks and Recreation Department describing the waterway. This area had long been famous for its fishing and canoe trips, and it was felt that unsupervised use might increase to the point of degrading the habitat. To quote again from the pamphlet: "The Allagash is not a wilderness in the sense of being untouched by man. It is a wilderness in the sense that those who visit it can enjoy basic living under natural conditions in direct contrast to modern man's daily environment." Use can vary from boating on Chamberlain Lake to floating the entire 92 miles of the waterway by canoe. Needless to say, at the proper time of year the opportunities for fishing along its course are excellent. For more information on regulations, campsites, a brief history, etc., contact the Department of Parks and Recreation, Augusta, Maine.

The Maine Forest Service also provides sportsmen with camping areas throughout the approximately 10.5 million acre Maine Forestry District. This district is composed of unorganized towns, most of which are in the back country. Through co-operation with private landowners, an Authorized Campsite Program was established and basic campsites developed to provide "safe, sanitary camping and picnicking areas for the general public." As a good share of these campsites are on or near lakes, ponds, rivers, and streams, fishermen benefit highly. For a map and listing of campsites contact the Maine Forest Service, State Office Bldg., Augusta, Maine.

Another item of interest to sportsmen concerns the unique pattern of land ownership and usage in the wilderness area west of Route 11. Large timber companies and private individuals owning this land are maintaining it primarily for forestry products. Vast networks of roads have been and are being built to allow harvest of logs and pulp wood. As the harvest of an area is completed the roads often are no longer maintained, so access is an ever changing maze. Most of the larger lakes and ponds are easily reached by car or four-wheel drive vehicles, and many smaller waters are within comfortable walking distance of a gravel road. This is a boon for the fisherman who can't afford the price of a float plane trip into the back lakes, though planes are still the best means of access to many still remote areas. Currently, gates are maintained on the larger roads, and a fee or permit is required to drive on them. If you're planning a trip into this part of the region, check with the landowners concerning use of such roads. Always bear in mind that these are *private* roads open to the public. Above all, respect the differences between driving a 12-foot-wide truck loaded with tree-length logs and your own easily maneuvered vehicle. It's easier for them to pull you out of the ditch than vice-versa!

THE FISH RIVER REGION has the two largely distinct land uses of forestry and agriculture, but its population remains low. Low population has resulted in less environmental degradation than that found in most other areas of the state. There remain large tracts of unspoiled wilderness. To conserve these areas for ourselves and for posterity, we must all pitch in to assure careful land and water use planning — *now*! Without this type of planning and regulation, this region, *too*, will soon take on the scars of development common to most of the northeast. The northern portion of the Grand State of Maine is the last frontier — let's all keep it that way. ■

When It's Springtime at the Hatchery . . .

By Dennis King

Wardens assist hatcherymen in stocking landlocked salmon.

TO SOME, the gradually lengthening days of early spring stir a restlessness to take a crack at the favorite, newly opened stream; to others, a last fling with the beagle and the old "side-by-side"; and to the Fish and Game Department's 31 hatcherymen, the months of March, April, and May have yet another special significance.

At this time of year, hatchery personnel encounter their busiest days. In fact, for these men to complete their spring tasks, it is essential that they prepare thoroughly during the winter months.

The new responsibilities facing the men in the spring at Maine's 10 hatcheries and rearing stations include: tagging, marking, and stocking Atlantic and landlocked salmon; rainbow trout egg harvesting; stream stocking of brook trout and brown trout; and togue planting. At the same time these activities are being carried out, there may be up to 1,500,000 newly-hatched fry that require, feeding, cleaning, and treating.

Lake stocking of the yearling landlocked salmon usually occurs in May and June. After some of their numbers are fin-clipped for research purposes, the fish travel by truck to the designated ponds; if their destination is inaccessible by road, the fish are flown by warden aircraft.

Hatchery crews tag Atlantic salmon at Cobb hatchery in Enfield around the middle of March; the fish are scheduled for release into the rivers of their parental origin in May. Tagging is quite an extensive operation at the rearing facility, involving the combined effort of hatcherymen, fishery biologists, and several local women who affix the small, green identification tags to the dorsal fin of the sea-run salmon. They tag upwards of 13,000 fish yearly. The stocking program is done in cooperation with the Atlantic Sal-

Many hands, much work — the tagging operation at Cobb hatchery, Enfield.

Stripping a rainbow trout at Ela rearing station, Embden.

mon Commission. Needless to say, the Hatchery Division has played no small part in the restoration of the Atlantic salmon to Maine's rivers.

The rainbow trout — in contrast to other trout and the salmon — is a spring spawner and its eggs must be harvested at this time. The egg-taking gear, so familiar to hatcherymen, such as the trap nets in which the brood fish are

Deft hands sew tag to dorsal fin of Atlantic salmon.

harmlessly gathered, the egg pans which allow the mixing of the eggs and milt, and the hatching troughs where the fertilized eggs mature, is taken out of storage and disinfected for the cultivation of the colorful rainbow.

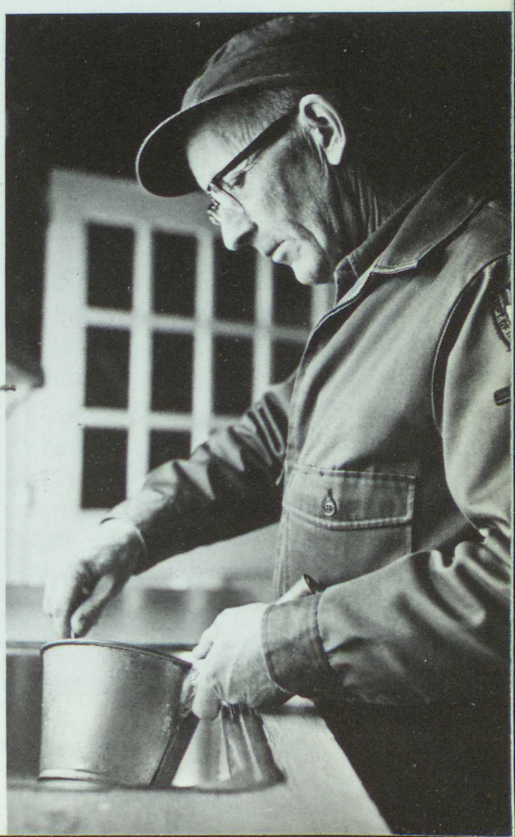
Of interest to some fishermen is another hatchery program conducted in the spring — the "put and take" brook trout stocking. Carried out in May, the program supplies various streams throughout the state with a predetermined number of 6-8 inch trout. Brook trout fry and brown trout are also stocked in a limited number of selected streams in May of each year to bolster supplies of wild fish.

Togue stocking presents additional concerns for the fish culturists. Togue are rather difficult to raise and demand special care in handling. In stocking, they must be boated out to the most suitable area in the lake. Wardens assist in the release of togue as well as salmon.

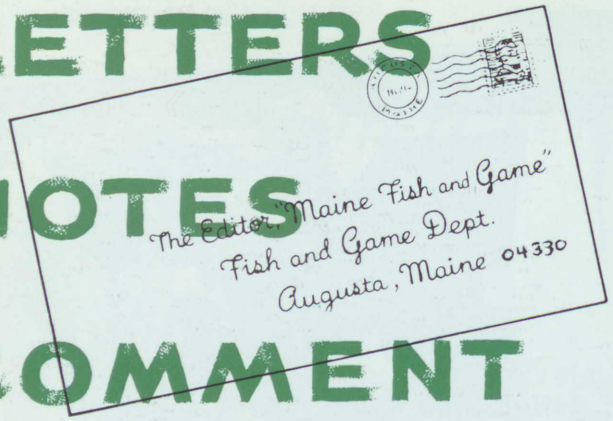
During the spring period, routine tasks such as screen cleaning and changing, feeding and caring for older fish, and normal equipment maintenance cannot be ignored.

Stocking, tagging, egg harvesting — it all adds up to a pretty busy season for the Fish and Game Department's hatcherymen. Their thoughts are probably on the hazy days of summer! ■

Hatcheryman mixes food for 100,000 young fry.



LETTERS NOTES COMMENT



Maine Fish and Game occasionally prints letters of general interest. All letters must be signed, though the name will be withheld on request. We are always happy to get your comments and are especially interested in article topic suggestions.

ABOUT OUR COVERS

We are pleased with the response to the full color cover of the winter issue of Maine Fish and Game, and we wish we could answer the questions about the picture. Very few of the many, many pictures in our files are unlabelled; unfortunately, this is one of them, and it was just right for our winter cover. There have been a good number of guesses about where the picture was taken. We have tried to find out which of our departed personnel took the shot, but to no avail. If anyone knows the answer to where the picture was taken or who took it, we'd like to know!

Plans for additional use of color pictures in future issues include a center section of two pages devoted to full color. We have had some requests for copies of the winter cover, and we probably will receive additional queries as we print more color.

Unless enough of them are sold, the cost of producing printed color pictures is prohibitive. For that reason, we would like to get an idea of how much demand there might be, so we're conducting a small survey.

If you feel that you would be willing to pay $1.50 or thereabouts, postpaid, for a scenic picture in color, will you let us know? It would be printed on heavy stock like the magazine cover stock, with a margin to allow for framing. Just send a post card to the editor and give us your opinion. If there is enough demand, we will start the operation and will let you know in our next issue. (No need to sign the card unless you wish to.) Thank you.

LAST YEAR'S DEER SEASON

The leaflet on the 1972 deer season won't be out for a few months, but some figures are available now and make interesting reading. They may help settle some office wagers and friendly arguments that always develop during discussions of a Maine deer hunting season.

Official deer kill — 28,698.

Archery kill (included in above)—34 (a new record and all by resident hunters).

Nonresident deer kill—6,459 or 22.5 per cent of total.

Number of hunters (approximate)—resident (147,500); nonresident (30,000).

Deer sex and age breakdown—adult bucks (13,429), fawn bucks (2,657), adult does (9,899), fawn does (2,593), unknown (120).

County	1972 deer kill	Kill per square mile	Rank in kill per sq. mi.
Androscoggin	619	1.28	8
Aroostook	2,560	0.40	16
Cumberland	1,295	1.46	7
Franklin	1,401	0.80	13
Hancock	2,060	1.28	9
Kennebec	1,354	1.55	6
Knox	679	1.84	5
Lincoln	1,067	2.33	3
Oxford	2,605	1.26	10
Penobscot	3,375	1.02	11
Piscataquis	1,724	0.45	15
Sagadahoc	483	1.89	4
Somerset	2,485	0.64	14
Waldo	2,089	2.86	1
Washington	2,203	0.91	12
York	2,625	2.62	2
Unknown	74	—	
Statewide	28,698	Average 0.94	

SUBSCRIPTION EXPIRING?

Don't take a chance on missing a single issue of **Maine Fish and Game** — check to see when your subscription expires.

If you see LAST COPY printed on your mailing label, the current subscription has run out.

The last two digits on the top line of the label code indicate your last issue—33, for example, stands for the 3rd (summer) issue of 1973.

THE BOOKSHELF

Listed here are books on subjects of interest to those who enjoy the outdoors. These notes are set forth mainly to call your attention to the publications. If we have been able to evaluate a publication and recommend it, we will do so; but a lack of comment does not mean that the book is not deserving.

If Deer Are To Survive, by William Dasmann, published in 1971 by The Wildlife Management Institute; Stackpole Books, Harrisburg, Pa. 17105. Hard cover, 128 pages. Replete with many references, this book treats in a non-technical way the many problems deer face and also discusses various aspects of deer management. $4.95.

Two more in the Living World series: *The World of the Ruffed Grouse* and *The World of the Wild Turkey*. Leonard Lee Rue, III, did the text and photographs for the grouse book, and James C. Lewis wrote the turkey volume, illustrated with photos from numerous sources. Both books published in 1973 by J. B. Lippincott Co., Philadelphia, PA 19105. Hard cover, 160 and 158 pages respectively. These titles join a list of about 30 books in the series, all well illustrated and authoritative. Each is $5.95.

No Horns Blowing (A Guide to Canoeing 10 Great Rivers in Maine), by Eben Thomas, published in 1973 by Hallowell Printing Co., Hallowell, ME 04347. Paperback, 134 pages. Tips on how to prepare for canoe trips, along with specific information about the access, degree of difficulty, etc., in connection with 10 river trips. With maps and numerous photographs. $3.95.

ABOUT ECOLOGOGRIPHS

Here's a new kind of puzzle we think you'll enjoy. It should be interesting for teachers to use with their classes, for sportsmen to while away rainy weather with, and, in fact, for anyone to test his knowledge.

We're running this one to see what our readers think of them. If you would like us to continue, drop us a post card so we'll know what your opinion is.

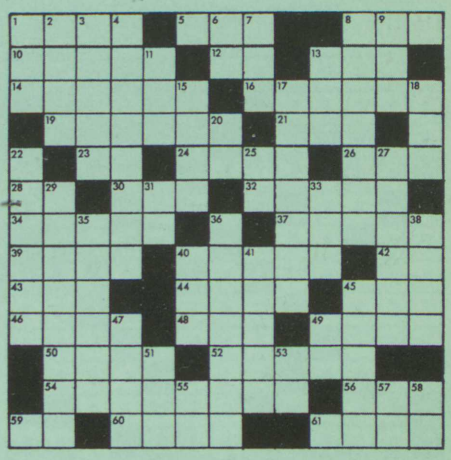
ACROSS

1. Amphibian which, unlike the frog, returns to water for breeding only.
5. Long-eared mammal related to the horse.
8. Cavern occupied by animals.
10. One of various harmless snakes of U.S.
12. Continent.
13. To use oars to propel a boat.
14. Shorebird with upturned bill.
16. Plump, round-headed, short-necked shorebird.
19. Unlike the hare, offspring are born naked and blind.
21. Frozen water.
23. Xenon (abbrev.)
24. To tow net along bottom of water to take fish.
26. A low island along a coast.
28. Initials of common names for: Icterus; Lama vicugna.
30. Spawn of a female fish.
32. Nocturnal, vegetarian, one-lung mollusk.
34. Small donkey used as a pack animal.
37. Covers about two-thirds of earth's surface.
39. Trapshooter's target.....pigeon.
40. Web-footed birds that feed in stubble or grassy marshes.
42. Tellurium (abbrev.)
43. Initials of common names for: Dasypodidae; Felis Tigris; Iguanidae.
44. Pond scum.
45. A grassy field or plain.
46. Long tooth of boar, walrus or elephant.
48. Cone-bearing, resinous tree.
49. Fish with saw-toothed spines at base of dorsal and anal fins.
50. Strap attached to bit to control an animal.
52. Tree with aromatic wood.
54. Opposite of hibernate.
56. Cigar-shaped predator fish.
59. Opposite compass points.
60. Of ebony.
61. Shelter of canvas.

DOWN

1. Tail or tip of the tail of any animal.
2. Skunk's forte.
3. North African antelope with long, twisted horns.
4. Fruit of the low blackberry.
6. Opposite compass points.
7. Juice of plants that contains and transports necessary growth materials.
8. Northern coastal bird with stubby bill and very short neck.
9. A female sheep.
11. Curved side timber bending away from keel in a boat.
13. Legendary powerful bird of prey.
15. Rise and fall of the surface of the ocean.
17. Woody vegetation.
18. Fish with flattened body and no anal fin. A bottom feeder.
20. Initials of a conservation conscious President.
22. Cat with short tail that is black only above at the tip.
25. To the same extent or degree.
27. A click beetle.
29. Powerful birds. Voice is a hiss; feed on carrion.
31. Popular size shot used in hunting large game.
33. One who excels in any field.
35. Breeds.
36. Large, fish-eating bird with oversized, pouched beak.
38. Tide occurring after first and third quarters of the moon.
40. Initials of common names for: Oryx gazella; antilopinae; Diptera.
41. Heron.
45. Fish with upper jaw extending beyond the eye: .....mouth bass.
47. Bird of hawk family with pointed wings and forked tail.
49. Central America (abbrev.)
51. The beak of a bird.
53. Doctor of Entomology (abbrev.)
55. Very Old (abbrev.)
57. One; one kind of.
58. Football position (abbrev.)

ANSWER ON PAGE 32



NOTES FROM HERE AND THERE

Warden Arnold Beleckis relayed this story: I was answering a call concerning dogs running deer, and found that a man had been attacked by a dog. When I asked him "Any injury?" he answered, "Left ear bitten pretty bad." At that, I advised him to see his doctor at once, but he replied that it was the dog that was bitten. "When he jumped me, I bit him in self defense. Look for a large, shepherd type dog with a badly bitten left ear." I turned the incident over to the local dog officer.

The familiar shoulder patch identifying the Maine guide is back. In one of two new programs of interest to Maine guides, the Department has begun issuing one patch with each guide's license sold. Additional patches are one dollar each, from the Augusta office. The second program is the issuing of a card, laminated in plastic, attesting to the length of service of those guides who have held a license 25 years or more. The card is signed by the Governor and the Fish and Game Commissioner.

Our deputy chief warden, Charles S. Allen, is the first Maine warden to be invited to attend the F.B.I. National Academy. The intensive course runs from April 2-June 22. Allen started as a district warden in July 1954, became a supervisor in May 1961, and has been deputy chief since January 1971.

A new fishery study will be looking into the effects of hooking on salmon — the first such investigation to be done in Maine. Research Biologist Kendall Warner will be finding out the extent of injury hooking does, the time it may take for hooking to kill a fish that is released after hooking, and the catch rate and hooking efficiency for various kinds of lure.

A uniform set of ice fishing rules has been worked out by Department representatives and New Brunswick officials, for East Grand and Spednic lakes on the border. They became effective in February and will be in the next ice fishing booklet, coming out this fall.

Another dog story, this one from Warden Langdon Chandler: I was investigating a complaint about dogs chasing deer, and the man gave this account of what happened. The deer was chased behind a house whose owner had thrown out some potatoes for the birds. As the deer ran by, it picked up a potato in its mouth and continued, with the dogs in pursuit. The deer escaped uninjured to enjoy its snack.

A new $30,000 fishway at West Grand Lake was completed last fall by Georgia-Pacific Corporation, in a new dam the firm built in 1971. It will allow passage into the lake from Grand Lake Stream, for landlocked salmon which drop downstream to spawn, and their young can also use the fishway when they wish.

1973 LICENSE FEES

Resident

Hunting (under 16)	$ 1.50
Hunting (16 and older)	6.50
Combination hunting and fishing	10.50
Fishing	6.50
Archery	6.50
Fishing* 3-day	6.50
*(Exchangeable for season)	.50

Nonresident

Big game (necessary for deer and bear)	$42.50
Small game	20.50
Small game, junior (under 15)	12.50
Archery	42.50
Fishing: season	15.50
Fishing: 3-day	6.50
Fishing: 7-day	7.50
Fishing* 15-day	10.50
*(Exchangeable for season)	5.50

For other fees, please write to the Department

In January, the annual winter waterfowl inventory came in for attention, with Chief Warden Pilot George Later flying the coastal survey routes while Migratory Bird Research Leader Howard Spencer and his assistant, Gary Donovan, conducted the count. This 20th annual survey showed that the black duck — the hunter's favorite in Maine — was present in about the same numbers as last year.

The annual warden school at the University of Maine in Orono turned out 13 inland wardens, two sea and shore wardens, and two rangers from Baxter State Park this year. It's an eight week course to acquaint new men with all facets of Department operation and provide them with the latest in law enforcement techniques and methods. The graduates now are at their duty stations around the state.

ANSWER TO PUZZLE ON PAGE 31

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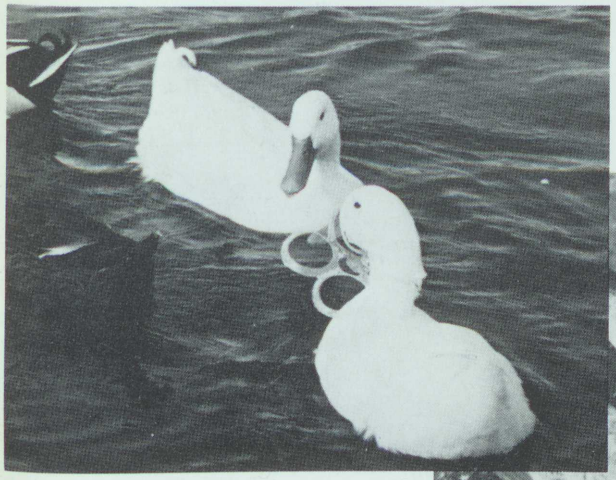
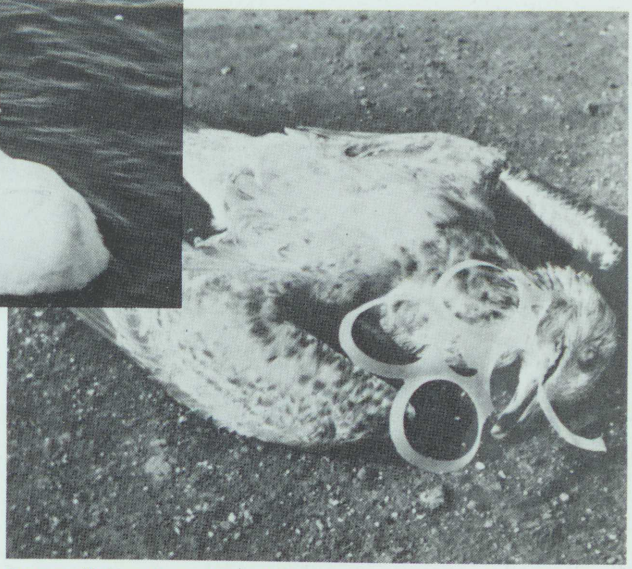
PICK IT UP BEFORE THEY DO



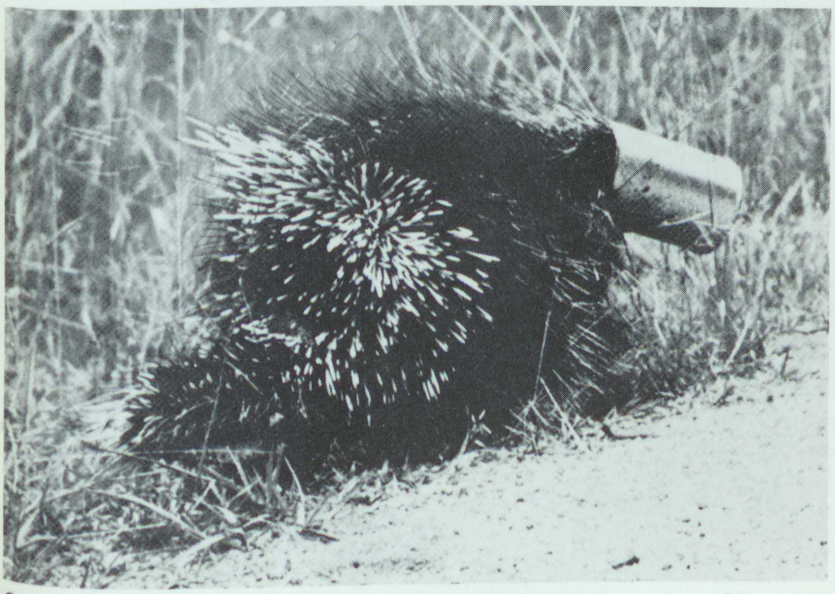
Courtesy—Daily Kennebec Journal



Courtesy—Michigan Dept. of Natural Resources

Courtesy—Michigan D.N.R.

Courtesy—Michigan D.N.R.



Courtesy—Mrs. Jamie Cope

Litter Hurts More Than Maine's Scenery!

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